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THE

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VOLUME FOURTH.

EDINBURGH:
PUBLISHED BY JOHN ANDERSON, JUN. 55, NORTH BRIDGE STREET, EDINBURGH;
COWIE, LOW, & CO. LONDON; RICHARD BURDEKIN, YORK;
AND WILLIAM CURRY, JUN. & CO. DUBLIN.

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ENCYCLOPÆDIA EDINENSIS.

Geometry.

GEOMETRY, derived from two Greek words, and literally denoting *the measuring of the earth*, includes that branch of mathematics which relates to the properties of extension and figure; and, from the annual overflowing of the Nile, by which the ordinary land-marks are obliterated, is supposed to have had its origin, or to have been first cultivated in Egypt. See MATHEMATICS.

GEORGE'S, or KING GEORGE'S ISLANDS, are two islands in the South sea, in south latitude 14° 28′, and in west longitude 144° 56′, discovered by commodore Byron in 1765, and visited by captain Cook in 1774. The larger island is about ten leagues in circumference; and the smaller, which is two leagues distant, is about twelve miles long and four miles broad. The rocks of both islands consist of coral, which are little elevated above the surface of the water, and are thinly covered with soil. A kind of scurvy-grass, the produce of these islands, being bruised and mixed with shell-fish, and thrown into the sea, has the property of intoxicating the fish, which then rise to the surface, and may be taken with the hand. Although these islands are nearly 3000 miles distant from New Zealand, the same ceremony of touching noses, as an expression of civility, is practised in both places.

GEORGIA, a country of Asia, formerly subject to Persia, but recently annexed to Russia, is situate in the southern declivity of the Caucasian mountains; bounded by Circassia on the north, by Daghestan on the east, by Armenia on the south, and by Tauria on the west; and comprehended between the 40° and 43° of north latitude, and the 44° and 48° of east longitude.

General description.—The north, and part of the east sides of this country, are walled by the stupendous mountains of Caucasus, branches of which also traverse and diversify the whole face of the country. Many of the summits of these mountains are constantly covered with snow, which feeds the innumerable rills and torrents that, meeting and uniting their waters, constitute the streams and rivers which beautify and fertilize the vallies and the plains. The Kur is the largest of the rivers, has its source in the Caucasian range, and flows eastward, with many windings, through the heart of the country to the Caspian sea. The Araqui and the Alesan, are also streams worthy of notice; the former, after a long course, joins the Kur, and the latter flows on the boundary between Georgia and Shirvan. Like other mountainous tracts, the temperature of Georgia varies greatly at very short distances; but the climate is, on the whole, remarkably pleasant and healthful, and the soil so exceedingly fertile as to yield in profusion the rarest plants and the richest fruits, with very unskilful culture. The cotton-tree grows spontaneously; fruit-trees in almost all their kinds and varieties are in like manner indigenous to the soil. The sides of the mountains are clothed to a great height with noble forests of oak, ash, beech, and elm, and other timber trees, festooned with wild but prolific vines, which grow over all the country like the bramble-bushes of Britain. The vallies afford the finest pasturage, as well as abundance of rice, wheat, millet, hemp, and flax, with little care on the part of the husbandman. The mountains are productive of useful minerals,—the birds and beasts of the country are numerous and various,—and the rivers are the resort of different sorts of fish: And indeed nature has lavished her bounty on this delightful region with so liberal a hand, that it has been long a favourite opinion with many, to consider it, or some of the adjacent districts, as originally the garden of Eden, prepared for the reception of man when innocent and happy.

Georgia.

Inhabitants, &c.—The population of Georgia amounts to about half a million, existing in a kind of feudal state; for the nobility have unlimited controul over their vassals, and exact from them the full half of the produce of the land they are allowed to occupy, in the shape of rent. The Georgians are Christians of the Greek church, and are said to have received their name from St George their tutelary saint. They build their churches on elevated situations, and many of them content themselves with viewing them from a distance. They dress in the Asiatic style like their neighbours the Persians; the hair, beard, and nails of the men are frequently dyed red, and the women braid their hair into tresses, and paint their eyebrows black. They are generally educated in convents, and can all read and write,—qualifications not generally possessed by the men. In the streets the women always wear veils; and it is reckoned indecent in men to accost them, as well as in company to inquire of a husband for his wife. Girls are betrothed at an early age, often before they have reached their fourth or fifth year. Travellers accuse the Georgians of drunkenness, cruelty, superstition, sloth, avarice, and cowardice,—vices which ought to be attributed to the abject state of subjection in which they are held, and not to any defect in their moral constitution, as, in similar circumstances, they are the growth of every climate. In respect of personal appearance they are said to be the most beautiful people in the world—tall in stature, remarkable for symmetry of form—black eyes, a fine face, and expressive features. They have few manufactures, and little trade except in slaves, the Mamelukes of Egypt and the harems of Turkey having been for many ages supplied with the sons and daughters of the natives; parents consenting to give up the most beautiful of their daughters to a life of concubinage. This detestable commerce is in the hands of Jews, who buy the slaves from their parents, husbands, and guardians, and transfer them to the Turkish merchant.

Towns.—Teflis, the capital, is a considerable city on the declivity of a hill, the base of which is bathed by the river Kur, about 100 miles north-west from the Caspian. It is defended by the rocky banks of the river, by a wall, and a fortress; and, among other public buildings contains a spacious palace, formerly the residence of the prince of the country, now of the Russian governor. The population exceeds 20,000, and the chief articles of manufacture and trade are silk, furs, and boya, a root used in dyeing linen. In the vicinity are sulphureous springs, fine gardens, and delightful villas. The other towns are Sogan-lou, a large village on the Kur, with a royal palace in the neighbourhood; Suram, a small town with a strong fortress; Gori, a trading town composed chiefly of mud-built houses, and defended by a castle on an eminence; Cozac-lore, the capital of a district, on one of the tributary streams of the Kur; Dalyjan, a town at the foot of a steep mountain; and various other towns and villages, as well as the seats of the chieftains, diversify the face of the country.

GEORGIA, one of the United States of America, is interposed between South Carolina and the Floridas, and extends from the Atlantic ocean westward to the great river Mississippi, comprehending an area 600 miles long from east to west, and 250 broad from north to south.

Aspect.—The coast when viewed on the great scale in connection with that of Carolina on the north and of East Florida on the south, forms the sweep of a great bay, of which the shore of Georgia is the deepest part; the coast is also studded with islands, and broken with estuaries. The shore is low, and frequently marshy, and for 30 or 40 miles inland is entirely level, and destitute even of small stones, indicating an encroachment of the land upon the sea by means of the deposited mud carried down from the mountains by the rivers. The Alleghany mountains, which extend through North America at an average distance of 250 miles from the Atlantic ocean, terminate in this state, and diversify the whole of the upper part of its eastern division by means of their elevated summits, lateral branches, and varied acclivities. Beyond this chain is the vast valley of the Mississippi, with a gradual descent toward the gulf of Mexico, traversed by that majestic river and its extensive system of tributary streams, as well as by others which flow southward from the mountains in their own respective channels till they join the ocean. The whole of this surface is richly clothed with the most luxuriant and diversified vegetation.

Rivers.—The Savannah, which forms the boundary between Georgia and South Carolina, has its source in the Alleghany mountains, and receives so many tributary streams that it is navigable a long way up its channel. In 1796 it rose 35 feet above its ordinary level, and between nine and ten feet higher than had ever been known before; at that time the streets of Augusta were plied with boats which could carry 15 tons. St Mary's river falls into the Atlantic at the southern extremity of the state, which it separates from East Florida, and has its origin in a vast swamp which is said to be 300 miles in circumference, and to contain several insulated tracts of fertile land. This river flows in a very winding channel, and the banks are marshy, or covered with thick woods. The intervening rivers, the Alatamaha, the common channel of a large district, and the Ogeechee, both of which flow from the mountains to the Atlantic, nearly parallel in their courses to each other, and those of the boundary river already noticed. The Great and Little Sitilla, Tarth, and Crooked rivers, also water this division of the country. The Pearl river, the Pascagoula, the Alibama, the Mobile, the Escambia, the Chatahouchee, and the Apalachicola, descend from the heights of Georgia through Florida to the gulf of Mexico.

Climate and soil.—The situation of Georgia traversed by the 31st parallel of north latitude, ensures it a high temperature at all seasons of the year. The The range of Fahrenheit's thermometer is between 40° and 90°; of course frost, except on the summits of the mountains, is a rare phenomenon. But the air of the plains, contaminated with putrid vapours exhaled from the swamps, is unfriendly to the health of the inhabitants; the hilly districts, especially where cleared of wood, enjoy a purer atmosphere, and consequently a higher degree of salubrity. The soil is a mixture of black and red earth, in some places gravelly, but everywhere fertile. The soil of the islands and the shore is grey, formed of sand and black mould; and about 90 miles from the sea is a bank of oyster shells extending parallel with the coast between the Savannah and the Alatamaha rivers, and seven miles broad.

Productions.—A large extent of the surface is covered with wood, in which are oak, pine, hiccory, and cedar; cotton, indigo, tobacco, rice, wheat, maize, and potatoes, with oranges, figs, and pomegranates, are the produce of cultivated districts. A large proportion of the soil is adapted to the growth of rice, and great quantities of that delicate grain are raised. The birds and beasts of Georgia are the same as in Florida or Carolina, already described. The rivers, bays, and lagoons are well stocked with fish in great abundance and variety.

Inhabitants.—According to a census of the United States, taken in 1810, the population of Georgia amounted to 252,433, of whom 105,218 were slaves. In 1800 it was 162,686, of whom 60,000 were slaves; so that if the increase has gone on in the same proportion during the last ten years, the population must now amount to nearly half a million of souls. The Indian tribes of this part of America are the Cherokees, the Chactaws, the Chicasaws, and the Creek Indians; they are still numerous, and much of the country is still in their possession. The prevailing religious sects are Baptists, Methodists, Presbyterians, Episcopalians, Quakers, and Jews. Literature has not hitherto made great progress; but a well endowed college is established at Louisville; George Whitfield founded Huntingdon orphan college a few miles south from Savannah; Franklin college was established at Athens in Jackson county in 1801; and it is proposed to endow a literary academy in every county of the state. The funds for the support of all these institutions, are derived from lands appropriated for the purpose. The constitution has been lately revised, and formed on the federal union of some of the other states.

Commerce.—Except the cultivation of the soil and the preparation of its produce for the market, Georgia may be regarded as destitute of manufactures. But the commerce of the state is extensive; and the chief articles of export are rice, indigo, tobacco, sago, lumber, naval stores, hides, bees-wax, and live stock; for which are received West India produce, teas, wines, dry goods, and wearing apparel. From the northern states are imported cheese, fish, potatoes, apples, cyder, and shoes. The greater part of this trade is carried on through the port of Savannah, which is safe and spacious. In 1803 Georgia was the sixth state in the value of its commerce; in 1805 its exports amounted to more than 3,000,000 dollars, and the number of American seamen to 11,225.

Historical notices.—Georgia was colonized in 1733 by indigent emigrants from Great Britain and Ireland, carried thither by General Oglethorpe, as the agent of government, free of expense. A fort was erected on the site of Savannah, a treaty of amity concluded with the Creek Indians, and land parcelled out among the settlers. Fresh accessions of emigrants arrived from Scotland, Germany, and Switzerland; towns were built, and a trade in furs was opened with the Indians. But insurrections among the colonists, and wars with the Spaniards and natives, checked the progress of prosperity, and involved the settlers in confusion and misery. In 1752 the trustees surrendered their charter to the king, and thus became and continued a royal government, till, with the rest of North America, it wrought out its own independence; and since that event it has been progressively advancing in prosperity and consequence.

Civil divisions and towns.—That part of the state which has been laid out into counties, is divided into the eastern, the middle, the western, and the southern districts. The counties of the eastern district are Glynn, Camden, Mackintosh, Liberty, Bryan, Chatham, Effingham, Bullock, and Wayne; of the middle district, Burke, Scriven, Montgomery, Columbia, Richmond, Jefferson, Washington, Warren, and Tatnall; of the western district, Hancock, Oglethorpe, Clarke, Jackson, Franklin, Elbert, Sinclair, and Wilkes; and of the southern district, Randolph, Jones, Baldwin, Wilkinson, Laurens, Telfair, Polaski, Putnam, Green, and Morgan.

Louisville, the chief town of the county of Jefferson, and the seat of the government, is situate on the north bank of the river Ogeechee, 70 miles from its mouth. It contains a state-house, tobacco warehouses, and about 800 inhabitants. The governor has his residence in this town, and the assembly meets in it annually. Large quantities of tobacco are inspected in it, and thence sent in boats to Savannah. Savannah, formerly the metropolis, on the south bank of the river of the same name in Chatham county, is regularly built in the form of a parallelogram; has an exchange, five places of worship, and 10,000 inhabitants. It is the grand emporium of the state; has a harbour easy of access, safe, and convenient, and is fast increasing in extent and opulence; but in summer it is unhealthy, and the prevalent diseases are bilious complaints and fevers. Augusta on the Savannah, 120 miles above the town just described, is the capital of Richmond county, and is ornamented with a church, an academy, government-house, a market-house, jail, and court-house. The streets cross each other at right angles, and Broad-street is decorated with a row of trees on each side, a mile in length. The town contains nearly 5000 inhabitants, more than a third of whom are slaves; about 100 are students. Augusta is a town of considerable trade. Brunswick, capital of Glynn county, at the mouth of Turtle river, is regularly planned, but not built to any extent; though, from the excellence of the harbour and the fertility of the soil in the vicinity, it promises to rise to commercial importance at no distant period. St Mary's, capital of Camden county, at the mouth of the river of the same name, has some coasting trade. Darien, the capital of Mackintosh county, stands near the banks of the great river Alatamaha. Sunbury, at the head of St Catharine's sound, pleasantly situate in Liberty county, has a good harbour, an academy, and some trade. Ebenezer, on the Savannah, though still a small town, is capital of the county of Effingham. Waynesburgh, the chief town of Burke county, is a thriving place. Sparta, in Hancock county, has a court-house and jail; stands in a fertile and populous country, and is a place of considerable trade. Athens, chief town in the county of Jackson, deserves to be noticed for the recent establishment of Franklin college, which is attended by between 80 and 100 students. Washington, the capital of Wilkes county, has a court-house, jail, and an academy, with about 500 inhabitants. About a mile eastward from the town a medicinal spring issues from a hollow tree, the inside of which is covered with a coating an inch thick, and the leaves around the spring are incrusted with a substance as white as snow.

GEORGIC, a poetical composition on the subject of husbandry, in which rules are delivered for the management of rural affairs. The appellation is derived from the Greek, and signifies *labouring the soil.* The Georgics of Hesiod and Virgil are well known to the classical scholar; and *Cyder*, a poem by Philips, affords the English reader an example of a similar production.

GEORGIUM SIDUS, the planet discovered by Herschel, and now more generally distinguished by the name of *Uranus*. See Astronomy.

GERANIUM, Crane's Bill, a genus of plants belonging to the Monadelphia class. This genus formerly included all the species of crane's-bill, but is now confined to such as have ten stamens, and come under the order Decandria; *erodium* comprehends those with five stamens, and is arranged under the order Pentandria; and *pelargonium*, the species of which have seven stamens, belongs to the order Heptandria. See Botany.

GERARD, John, an eminent botanist, and author of a voluminous work, the *Herbal*, or *History of Plants*, was a native of Cheshire, was born in 1545, and died about the year 1607. Having settled in London as a surgeon, he began to collect materials for his work, which may be considered a copious compilation of all that was then known relative to plants. The first edition was published in 1597, and the wood engravings with which it is adorned are the same as in the work of Tabernæmontanus, and were procured from Frankfort at the expence of the publisher. A second edition of this work appeared in 1633 in folio; and the editor, Thomas Johnson, professes to have corrected the errors and supplied the defects, that were owing to the author's want of learning. The second edition of this work, which is to be regarded chiefly as a literary curiosity, is perhaps one of the largest volumes in the English, or indeed in any other language; it extends nearly to 1700 pages.

GERARDIA, a genus of plants belonging to the Didynamia class.

GERMAIN en Laye, St, a town of the department of the Seine and Oise in France, stands on the banks of the Seine, contains about 9000 inhabitants, and the chief manufactures are skins and leather.

GERARD, Alexander, a learned Scottish divine, was a native of Aberdeenshire, and was born in 1728; received his grammatical education at Aberdeen, and after passing through the courses of language, philosophy, and divinity, was licensed in 1748; in 1750 was appointed assistant to Mr David Fordyce, professor of philosophy in Marischal college, Aberdeen, and at his death in 1753 succeeded to that chair. In 1759 he was ordained, and the year after nominated professor of divinity in the same college, and minister of the Gray-Friars church in Aberdeen. In 1771 he resigned his chair in the Marischal college along with his ministerial charge, and was appointed professor of theology in King's college, the duties of which he discharged till his death, which happened on his birth-day in 1795.

As a clergyman, Dr Gerard was distinguished by his exemplary conduct, and by the able and upright discharge of his clerical functions. As a professor of divinity he was particularly successful, and is said to have considerably improved the plan of teaching theology. Besides single sermons, he published an Essay on Taste, Dissertations on the Genius and Evidences of Christianity, an Essay on Genius, and two volumes of excellent sermons.

GERMANY, an extensive country in Europe, situated between the 45° and the 55° of north latitude, and the 3° and 19° of east longitude, is bounded on the north by Denmark and the Baltic, on the east by Poland and Hungary, on the south by Italy, Switzerland, and France, and on the west by the Netherlands, Holland, and the ocean; is nearly 700 miles in length and upwards of 600 miles in breadth, and comprehends a number of sovereign and independent principalities, associated by a federal union.

Aspect.—The external outline of so vast a surface must of course exhibit a great deal of variety; it may, however, be described in a general way, as rising into lofty mountains in the south, and as stretching out into expansive plains in the north, while multitudes of torrents and streams descend from the ridges and play amid the vallies of the upland country; and mighty rivers, directing their course, some of them to the east, others of them to the west, and others still toward the north, intersect and fertilize the plains.

Mountains.—The principal mountain chains, by which Germany is bounded or traversed, are the mountains of Tyrol, of which the Ortler-Spitze, the third highest mountain in Europe, ascends to the height of 13,430 feet above the level of the sea: These, as well as the mountains of Suabia and Saltzburg, may be regarded as a continuation of the Alps, which bend around the upper part of the gulf of Venice, and descend through Dalmatia. From this lofty chain which forms the southern boundary, inferior ridges and groupes stretch far both to the north and the west. Bohemia is encompassed by lofty mountains, of which the highest summit is nearly 4000 feet of perpendicular height. A still higher range runs in a north-easterly direction between Moravia, Silesia, and Hungary. The circles of Franconia and the Upper Rhine are both extremely mountainous; and Hanover contains the Hartz mountains, among which are the Brocken, 3690 feet above the level of the sea.

Rivers, lakes, and springs.—The rivers of Germany correspond in number and in size to the extent and elevation of its mountain chains. The Danube, which has its source in Suabia, and flows eastward to the Black sea, is one of the noblest streams in Europe, and receives the Inn and many other large rivers issuing from the mountains, both on the right and left of its majestic course. The Rhine, though it can scarcely be enumerated among the streams of Germany, yet deserves to be noticed, because it absorbs the waters of the Necker, the Mayne, and other large rivers. The Ems, the Weser, and the Elbe, flow westward from the mountains in the interior to the ocean; and the Oder and several smaller streams hold a northward course to the Baltic. Exclusive of mountain torrents, this part of Europe is said to contain 500 rivers, 60 of which are navigable to a considerable extent. The great lake of Constance is situated partly in Switzerland and partly in Germany. Numerous lakes are distributed in the upper parts of Austria and Bavaria; but in Mecklenburg, Brandenburg, and Pomerania, the lakes have a different origin and character from those formed in the picturesque and pent-up vallies of the south. The mineral springs of the country are said to exceed a thousand, of which Carlsbad in Bohemia, Toplitz in Austria, Seltzer on the Upper Rhine, Pyrmont in Westphalia, and the waters of Aix-la-Chapelle, are chiefly celebrated.

Climate and soil.—The air of Germany is every where temperate and salubrious, except amid the low-lying and marshy districts of the north. The summer heat of the southern valleys is occasionally very high; and the diminution of forests has materially improved the climate of the interior provinces. The soil is extremely various. There is much fertile land, especially toward the south-west districts; but there are also large tracts of sand, barren heaths, and unproductive swamps. Hanover, and the Prussian dominions are especially distinguished in this way. The mountainous districts are all likewise diversified in point both of climate and soil.

Minerals.—In the mountains of Germany are found useful minerals in considerable abundance. Marble, with other architectural materials, is plentiful; millstones of a good quality abound in some of the rocks; coal is found in Westphalia; tripoli, porcelain, clay, fullers earth, and some other similar substances, are met with in Misnia; Saltzburg and Bavaria abound in salt springs; and the greater part of the mountains are highly metalliferous. Grains of gold occur in the channels of the rivers; the mountains between Saxony and Bohemia are rich in silver, copper, tin, lead, iron, cobalt, and bismuth; the same metals are also extracted from the Hartz mountains in Hanover; Carinthia and Stiria are productive of iron, which is converted into excellent steel; and the mercury mines of Idria have been long celebrated for their productiveness.

Vegetable and animal productions.—Extensive forests abound in the mountainous districts of this country, among which are the remains of the Hercynian forest of the ancients. Wheat, barley, oats, and rye, flax, hemp, and hops, constitute the principal objects of German agriculture. Rice, rhubarb, tobacco, madder, and saffron are cultivated, some of them extensively, in the south. Bamberg, in Franconia, yields a great deal of liquorice; fruits, especially apples, chesnuts, and walnuts are abundant; and the vine is cultivated with much success on the banks both of the Rhine and the Danube, as well as on the banks of many of their tributary streams. The breed of horses, horned cattle, and sheep in Germany is said to be valuable. The Merino breed has been long naturalized in Saxony; goats abound in most of the mountainous districts; and in all respects the same kinds of animals are domesticated as in Britain. The wild boar, the wolf, and the lynx are common in Westphalia and the Alps of Tyrol. The silk worm is reared in some places of the country; singing birds, such as the lark and the thrush, are common; and fish of various sorts are found in the rivers.

Inhabitants.—The population of Germany exceeds 30 millions; and though they are distributed among a great number of distinct states, they yet exhibit a national character, distinctly marked. The Germans are said to be frank, hospitable, candid, brave, and persevering. Their dress does not materially differ from that used in England; and they still possess the stately and well proportioned persons, the fair complexions, and delicate features, for which their fathers were celebrated by Tacitus. The nobility are proud, and tenacious of their dignities; the lower orders are sincere, faithful, and in general industrious. Emigration to the United States, and other foreign climates, is as common with them as with the British or the Irish.

Religion.—The Christian religion was introduced into Germany in the seventh century, and being the country of Luther it took the lead in the Reformation. Since that era, Catholics, Lutherans, and Calvinists are the sects to which the mass of the people have attached themselves. Liberty of conscience in matters of religious belief has been long enjoyed in most of the sovereign states; and at the recent congress of Vienna it was adopted as a fundamental principle of negociation. The Lutherans and the Calvinists of the Prussian dominions have laid aside these discriminating appellations, and have agreed to unite in one body by the name of the Followers of the Evangelical Faith. Many of the Catholic dignitaries were, till lately, princes of the empire; they are now confined to their spiritual functions. The Calvinists are governed by consistories; but the Lutherans, as is well known, have retained the gradation of rank among the clergy which prevailed in the church previous to the Reformation. The computed numbers of the different persuasions are as follows: Catholics above 15,000,000; Lutherans 12,000,000; Calvinists 2,000,000; Jews 183,000; Hernhutters 25000; Greek church 14000.

Literature.—Germany has at present twenty-one universities, attended by from eight to ten thousand students. Thirteen of these, namely, Berlin; Gottingen, in Hanover; Leipsic, Jena, and Halle, in Saxony; Heidelberg, in Baden; Tubingen in Wirtemberg; Erlangen in Franconia; Marpurg in Hesse Cassel; Giessen in Hesse Darmstadt; Kiel in Holstein; Rostock in Mecklenburg Schwerin; and Greisswalde in Pomerania, are protestant,—and six, namely, Vienna in Austria; Prague in Bohemia; Paderborn in Prussian Westphalia; Landshut in Bavaria; Wurtzburg in Franconia; and Freyberg in Baden, are catholic seminaries. The remaining two, namely, Breslau in Silesia and Bonn on the Rhine, are partly catholic and partly protestant. Bonn is a recent establishment. Erfurt, Olmutz, with some other universities, have been suppressed.

German authors are very numerous; and some of them are deservedly celebrated as the cultivators and improvers of natural philosophy, mathematics, astronomy, and chemistry. Geography, statistics, and political economy, have been also extensively studied. Classical learning is also carefully pursued by many; as well as poetry, music, and painting. Among the discoveries and inventions attributed to the Germans are, the art of printing, the air-pump, gun-powder, engraving on copper and wood; and Kepler, Leibnitz, Wolfius, Puffendorf, Hoffman, and Handel, Klopstock, Gesner, are among the philosophers, musicians, and poets who have flourished in the country.

Manufactures and commerce.—Linen is made in most places of the empire; woollen stuffs in different places, especially in Silesia; and silk is manufactured in Brandenburg, Austria, and Saxony. A good deal of cotton-cloth is now made in many of the German towns; but the twist has been hitherto chiefly obtained from Britain. Machinery of all kinds for facilitating the operations of the cloth-manufactures is still very scarce, and extremely defective, and a strong prejudice against its use prevails in the country. Bohemia is famed for mirrors and cut-glass; Saxony for the fabrication of porcelain. Pearlashes and pitch are made in various places; and iron, copper, and other metals, are not only mined and smelted, but wrought up into useful articles both for home-consumption and exportation.

The principal trading-towns are, Hamburg, Vienna, Lubec, Bremen, Frankfort, Breslau, Leipsic, Augsburg, Nuremberg, Stralsand, Stettin, Magdeburg, Ulm, and Naumburg. The chief articles imported are, the produce of the East and West Indies; wines from France and Spain; cotton-twist, and hardware from England; and raw cotton and other things from Turkey. The articles of export are both numerous and various, comprehending the produce of the country, such as timber, corn, fruits, salt, wool, butter, cheese, smoked meat, wax, and metals; and the fruits of industry, such as linen, lace, mirrors, glass, toys, and trinkets.

Political constitution.—It has been already noticed, that the German empire consists of a great number of independent states, associated together by a federal union. At one time its princes, secular and ecclesiastical, exceeded 300, besides a number of free towns, and a class of nobility under the princely rank. Each of these had a distinct jurisdiction, in the exercise of which none had a right to intermeddle; and none of them acknowledged a superior except the emperor. At first this supreme head was chosen by the suffrages of the princes, but afterwards by deputies called electors, who, in process of time, performed the office of election without any interference of the inferior princes. The whole country was divided into nine departments, called circles, namely, Austria, Bavaria, Swabia, Franconia, the Lower Rhine, the Upper Rhine, Upper Saxony, Lower Saxony, and Westphalia. The electors were also nine in number; but they did not derive their titles from the circles, but from certain cities and districts in which they had influence respectively: They were, the elector of Mentz, of Triers, of Cologne, of Bavaria, of the palatine of Saxony, of Brunswick-Lunenburg (Hanover), of Brandenburg (Prussia), and of Bohemia (king of Austria.) This was the state of the empire from a remote period down to the time of the French revolution; and during the war which resulted from that great event it was variously modelled, and came ultimately entirely under the power of the ruler of France. When that formidable power was subdued, a new order of things took place, which still subsists. The states composing the empire were then formed anew into a federative body, to be governed by a diet. The number of votes in the Germanic diet is 69; but, to prevent the smaller states from having an equal voice with the larger, a farther repartition of votes has been agreed on, in consequence of which the members of the empire are commonly reckoned 17, as follows: 1. Austria; 2. Prussia; 3. Bavaria; 4. Saxony, kingdom (not the duchies); 5. Hanover; 6. Wirtemberg; 7. Baden; 8. the electorate of Hesse; 9. the grand duchy of Hesse; 10. Denmark, for Holstein and Lauenburg; 11. the Netherlands, for Luxemburg; 12. the grand ducal, and ducal houses of Saxony; 13. Brunswick and Nassau; 14. Mecklenburg-Schwerin and Strelitz; 15. Oldenburg, Anhalt, and Schwartzburg; 16. Hohenzellern, Lichtenstein, Reuss, Schaumburg-Lippe, Lippe, and Waldeck; and 17 of the free towns of Lubec, Frankfort, Bremen, and Hamburgh. This repartition applies to all ordinary discussions. When fundamental laws are to be enacted, the diet forms itself into a general assembly, in which each state votes individually, and where a majority of two-thirds is requisite to accomplish a change.

Pecuniary contributions are voted by the members of the diet for five years. The military contingent of the empire is 120,000 men in time of peace. Its revenue, computed in sterling money, is L.18,229,000. The fortresses essential for its defence, Mentz, Luxemburg, Landau, Germersheim, Homberg, and Ulm, are declared to belong to the confederation.

Principal towns.—Vienna, inhabitants 260,000, Berlin 160,000, Hamburgh 115,000, Prague 82,000, Breslau 60,000, Dresden 50,000, Munich 46,000, Frankfort-on-the-Maine 40,000, Bremen 40,000, Cologne 39,000, Lubeck 35,000, Leipsic 32,500, Augsburg 30,000, Magdeburg 29,500, Brunswick 29,000, Nuremberg 27,000, Aix-la-Chapelle 27,000, Brunn 25,000, Mentz 25,000, Halle in Saxony 24,000, Stutgard 21,000, Stettin 21,000, Hanover 20,000, Cassel 19,000, Manheim 18,000, Potsdam 17,000, Lintz 17,000, Erfurt 16,800, Wurtzburg 15,500, Ulm 15,000, Carlsruhe 14,000, Dusseldorf 14,000, Treves 13,500, Saltzburg 13,000, Hanau 12,000, Brandenburg 12,000, Frankfort-on-the-Oder 12,000, Gotha 11,600, Stralsund 11,000, Embden 11,000, and Olmutz 11,000.

Historical summary.—We are indebted to the Roman writers, especially to Tacitus, for the knowledge we possess respecting the ancient state of this part of Europe; and, according to their account, it then comprehended not only most of the territories of modern Germany, but also the greater part of those of the United Provinces, Jutland, Hungary, Prussia, and Poland. It was bounded by the German ocean, the Baltic sea, the Danube, and the Rhine; and was inhabited by a great number of barbarous and warlike tribes. The principal of these were the Batavi, the Frisii, the Chauci, the Cimbri, and the Suevi, with their numerous subdivisions. Far separated as were the territories they inhabited, and widely different as were the names by which they were distinguished, they were yet closely assimilated by personal appearance, manners and customs, religion, language, and laws. They were distinguished by a lofty stature, red hair, and blue eyes. They are described as far from cleanly in their persons; as living in rude huts formed of timber, straw, and mud; as having no cities, except a kind of fortifications constructed in the centre of groves for the security of the tribes to whom they belonged; and as living in close association with their cattle and other domesticated animals. The rich wore a garment formed so as to display the shape of the body,—the northern tribes enveloped themselves in furs,—and a loose mantle, fastened with a clasp or a thorn, constituted the dress of a large proportion of the people both male and female.

It was the custom for mothers to nurse their own children; and it was accounted honourable to possess a numerous offspring. Women were treated with great tenderness and confidence; though neither wealth, rank, nor beauty could protect an adultress from a public whipping, or procure her a second husband. Males were generally trained to arms; and war formed so large a portion of the employment of the different tribes and clans, that they were denominated Geiermans, or warriors, and hence the modern name Germany. The tribes frequently fought with each other; but more frequently they leagued together to oppose the incursions of the Gauls, or to invade the territories of their neighbours.

The ancient Germans adored the sun, moon, and earth; they worshipped Thor the god of thunder, and Odin the god of war, with the other deities of the north, not in temples, but in woods, groves, and desert places; their priests bore some resemblance in manners, and in the influence which they exercised over the minds of the people, to the Druids of the Celtic nations; and their belief in omens and oracles, as well as the other features of their religion, has given rise to the opinion that they, and all the Gothic tribes, derive their origin from Persia.

The irruptions of the Cimbri and Teutones first brought the Germans in contact with the Romans. After the conquest of Gaul, Julius Cæsar constructed a bridge across the Rhine, and invaded the country of the Suevi, and added large tracts of it to the Belgic provinces. In the reign of Augustus, the conquered territory beyond the Rhine was erected into a distinct province, which was called Germaniacis-Rhenana; but the progress of the Roman arms experienced a signal check in Germany about the beginning of the Christian era, when the Cherusci, commanded by Arminius, cut off three legions under Varus, between the Lippe and the Ems; and, for several centuries subsequent to this event, the German tribes were in the practice of associating together to oppose the inroads of the Romans.

The empire.—Charlemagne was the first prince who entirely subdued Germany, and annexed it about the year 800 to the empire of the Franks, which before included France, Italy, and part of Spain. That wise prince committed the care of the provinces of Germany to governors called Graves, and established bishops among the Saxons, then a rude and savage race, with the view of softening their manners by the influence of religion. The descendants of Charlemagne, known in history by the name of the Carlovingian race of princes, being distinguished chiefly by their imbecility, became extinct after a few generations, and were succeeded by the princes of the house of Saxony.

Emperors of the House of Saxony, 919.—The dukes of Suabia, Bavaria, and Saxony had become powerful while the imperial authority was feebly exercised by Louis, the Infant, and Conrade, duke of Franconia. This latter prince endeavoured to check the ambitious usurpations of the German dukes; but failing in his attempts, on his death-bed he advised the princes of the empire to choose Henry duke of Saxony his successor; his advice was complied with, and Henry, surnamed the Fowler, was raised to the imperial throne. His son, Otho the Great, experienced some opposition from the descendants of Charlemagne; but he soon suppressed domestic rebellion, defeated the Huns, and added Italy to his empire. In consequence of this conquest, the states resolved that in future the emperor of Germany should also bear the title of king of Italy and emperor of the Romans, as well as that no pope should henceforth be chosen without his consent. Otho the Great was succeeded by his son Otho II. in 973, whose reign was rendered turbulent by the rebellion of the German princes. His son Otho III. began his reign in 983, and succeeded his father not only in the honours of empire but also in the trouble of intestine warfare. He was poisoned, and died without issue in 1001. Henry II., surnamed the Cripple, duke of Bavaria, and a descendant of the house of Saxony, was his successor. He also dying without issue, the imperial crown was transferred to the house of Franconia.

Of the house of Franconia, 1024.—The election of Conrad II. the first of this line, led to a civil war. The emperor first overcame the rebellion of his subjects; then added Burgundy and Arles to his empire; and finally carried on a successful war against the Poles. He was succeeded by his son Henry III. surnamed the Black, in 1039, who experienced much trouble from the intrigues of the clergy. He died in 1056, when his son, Henry IV. was only six years of age. When he took the reins of government into his own hands, he entered into serious disputes with the church. The pope threatened to depose him, and he actually deposed the pope. But he was afterwards excommunicated, taken prisoner, and deposed after he had fought more than sixty battles, in most of which he was victorious. He died in misery soon after his deposition, and was succeeded by his son Henry V. in 1106, who ceded to the pope, though not without a struggle, the right of bestowing the benefices of the church, which materially diminished the imperial power.

Of the house of Suabia, 1138.—Henry V. who died without issue, was succeeded by Lothario duke of Saxony, during whose reign the troubles of Italy were appeased; and on his death Conrad III. the first prince of the house of Suabia, was raised to the throne. He was succeeded by Frederick, surnamed Barbarossa, who reduced Italy and engaged in the holy wars. On his demise Henry VI. his son, came to the throne. He is said to have submitted to be crowned kneeling by the pope, who performed the ceremony seated in a magnificent chair; and as soon as he had finished it, kicked the crown from his head, in token of his right to take away as well as to confer the empire. He died in 1198, on his way to the Holy Land, and was succeeded by Philip his brother, who some years after was assassinated. Otho IV. was then made emperor, chiefly by the influence of the church, with which he soon after quarrelled. In the reign of Frederick II. the next emperor, the factions known in history by the name of the Guelphs and the Ghibelines arose in Italy, and for many years embroiled the greater part of Europe in their contentions. The last emperor of the Suabian line was Conraddin, who was beheaded; and after much confusion during an interregnum, in which robbery and bloodshed were extremely common, the towns on the Rhine, and many of the princes, entered into a defensive league, and exerted themselves in the suppression of violence and the dispersion and punishment of banditti.

Of the house of Austria.—In 1273, Rodolph, count of Hapsburgh, the founder of the house of Austria, was elected to fill the imperial throne. By the immense influence which this family afterwards acquired, in consequence of obtaining possession of Hungary, Spain, the Netherlands, and other extensive territories, it established itself at the head of the empire, a dignity which it still holds as a family heritage. Under Austria, the reader will find some account of the emperors of this race, with their transactions down to the time of the French revolution. And therefore, referring to what is stated on that subject, we shall here subjoin a few notices of the changes effected in the empire by this signal event.

Effects of the French Revolution.—In the year 1794 the French overran the Netherlands to the banks of the Rhine; and Prussia, actuated by a most impolitic jealousy, left Austria to maintain an unequal struggle against their encroachments. In the following year the French carried their conquests into the heart of the empire; and this invasion having taken place at the time when Bonaparte first came into general notice as the conqueror of Italy, the German princes were glad to have recourse to negociation; and, in 1797, the treaty of Campo Formio was concluded, by which all the German territories west of the Rhine were ceded to France. The difficulty of indemnifying the princes who had thereby been deprived of their hereditary property, the threatening aspect of Russia against France, and the triumphs of the English over that power in Egypt, determined Francis again, in 1799, to try the fortune of war. The emperor was at first successful; but Bonaparte having returned from Egypt, and put himself at the head of the army in Germany, the aspect of affairs was very speedily changed. The treaty of Luneville took place, and acceded to all the pretensions of France upon the empire; temporal princes were indemnified by the spoils of the church and depriving the free towns of their sovereignty. Some of the old electorates, Mentz, Triers, and Cologne were abolished, and new ones, Baden, Wirtemberg, Hesse-Cassel, and Saltzburg, were created in their stead. All this tended to diminish the power of the imperial house; it was thereby deprived of the influence which it had long exerted over the Catholic principalities; six of the electorates of the new system were Protestant, and Bavaria, though Catholic, was hostile to her interests. And by the humiliation of Austria, not only France, but Prussia and Russia, acquired an augmentation of political influence.

Necessity obliged the emperor to submit to this state of degradation for several years; at last, in 1805, in conjunction with Russia, he made another appeal to arms, and, at Ulm and Austerlitz, speedily lost his armies, and at the peace of Presburgh a large portion of his hereditary dominions. The French armies now stationed themselves in Germany, many of the princes declared themselves the vassals of Bonaparte; the confederation of the Rhine was formed at Paris; and Francis, in August 1806, publicly renounced the title of Head of the Empire. Bonaparte in the meantime, in virtue of his assumed title of Protector of the new confederation, created and annihilated kingdoms and principalities at his pleasure. Prussia, now aware of the designs of the ruler of France, took the field against him, and by means of the signal defeat which she experienced at Jena, was forced also to bow the neck to the yoke of the tyrant. The resistance which the French received in Spain and Portugal, forbade the Germans, though they were oppressed and impoverished by their conquerors, entirely to despair of deliverance. The mad and disastrous expedition of Bonaparte into the interior of Russia, and the important events by which it was followed, effectually roused the spirit of patriotism among the people, and of union among the princes of Germany. The grand alliance against the lawless usurpations of France was formed; her blood-stained armies were repeatedly routed; her ambitious ruler sent into exile; and Germany restored to the possession of her rights and privileges, by the congress of Vienna, and the convention of Aix-la-Chapelle.

GERMEN, the seed-bud of plants, which in the progress of vegetation becomes the seed-vessel.

GERMINATION, is the commencement of vegetation in the seeds of plants; to promote which, heat, air, and moisture are essentially requisite.

GERONA, a town of the province of Catalonia in Spain, occupies both sides of the Ter, and is defended with walls and fortifications. The population is estimated at 14,000, and the manufactures, which are not extensive, are confined to coarse woollen and cotton stuffs, and stockings. Some of the public buildings are splendid structures, and a college, the remains of an ancient university, still exists.

GEROPOGON, Old man's beard, a genus of plants belonging to the Syngenesia class, some of the species of which are natives of Italy.

GERS, a department of France, having the departments of Lot and Garonne, and Landes, for the boundary on the north and west, and Upper and Lower Pyrenees and Upper Garonne on the south and east. The name is derived from the river Ger, by which it is traversed from north to south. The length is stated at 55 miles, and the average breadth about 30 miles; the population exceeds 298,000; wheat and wines are the chief productions of the western districts; and the principal trade is in brandy.

Auch, capital of the department, which was formerly the metropolis of all Gascony, occupies an elevated position near the river Gers, and is remarkable for the cathedral, which is reckoned one of the finest in France. The population is nearly 8000.

Condom is the principal place of a district, and is 21 miles north-west from Auch. The number of inhabitants is about 7000.

Lectoure is also the principal place of a district, stands on a mountain near the river Gers, contains more than 5000 inhabitants, and is 16 miles north from Auch.

Lombes is a small town, 16 miles south-east from Auch, was the see of a bishop before the Revolution, and contains about 1500 inhabitants; and *Mirande* contains nearly the same population, and is the principal place of a district.

GERVASE, of Tilbury, an English author of the 13th century, derives his name from his native place, Tilbury, on the Thames; he was nephew of Henry II., and was in great favour with Otho VI. emperor of Germany, to whom he dedicated a Description of the World and a Chronicle. He is the author of a History of England and some other works.

GERUND, a verbal noun expressive of the time as well as of the manner of an action. See Language.

GESNER, Conrad, a celebrated naturalist, was born at Zurich in 1516. After receiving the rudiments of learning in his native place, he went to France, where he studied for some time, and afterwards to Basil for the purpose of improving himself in Greek and medicine. At Lausanne he was professor of Greek for three years; and, returning to his native city, he taught medicine and philosophy. He formed a museum of natural history; had a clear notion of method in botany, and arranged plants into classes, genera, and species. By his laborious researches he, at least, doubled the list of plants, and discovered some of their most useful medicinal qualities, particularly those of opium, which he raised from the rank of a poison to that of a most efficacious medicine. He was distinguished in almost every kind of erudition, particularly in natural history and philology. His eminent attainments in natural history procured him the title of the Pliny of Germany; and Boerhaave styles him *Monstrum eruditionis.* He died in 1565. His principal works are,—"Catalogus Plantarum;" "Historia Animalium;" his greatest work "De Fossilibus, Gemmis, Lapidibus, Metallis, &c.;" "Bibliotheca Universalis;" and a Greek and Latin Lexicon.

GESNER, Solomon, an eminent poet and painter, was born in Zurich in 1730. He was by profession a bookseller, as was also his father. In 1752 he made a tour through Germany, and on his return, in 1753, published a poem called "Night," which was followed by the pastoral of "Daphnis," and sometime after by his Idyls in imitation of Theocritus. These works, particularly the last, were much admired for their tenderness and rich description; but none of his productions added so much to his fame as the "Death of Abel," published in 1758, which has been translated into several languages. Among some other pieces which appeared after this work was his poem of the "First Navigator," by some reckoned his master-piece. He afterwards attempted the pastoral drama, but with less success. In this style of poetry he published Evander, a drama in three acts; and Erastus, in one act. At the age of thirty he turned his attention to landscape painting; and in 1765 published ten pieces, etched, engraved, and designed by himself, which, in 1769, were followed by twelve other pieces. His productions in this way have been so much admired, that he has been ranked among the best artists of Germany. Gesner's private character was in all respects amiable and engaging; and the esteem in which he was held by his countrymen appears in his being raised to the first offices in the state. He died in 1788.

GEUM, Avens, or Herb Bennet, a genus of plants belonging to the Icosandria class, and of which two species are natives of Britain.

GHAUTS, two chains of mountains which support the centrical table-land in the south of India: the word properly denotes a pass through a range of high hills: The chain of the Eastern Ghauts commences in the latitude 11° 20′ N. and extends to lat. 16 N. forming the boundary between the two Carnatics. The greatest height of this range of mountains is estimated at not less than 3000 feet: the rocks of which they are composed consist of granite, and the strata are much broken and confused. The ridge of the Western Ghauts extends from Cape Comorin to the Surat river; they include 13 degrees of latitude; the distance from the sea coast is about 40 miles, and rarely exceeds 70 miles; and the whole range is uninterrupted, with the exception of a break of 16 miles wide.

GHENT, a town of the Netherlands, and formerly the capital of Austrian Flanders, is situated at the confluence of the Scheldt and three other navigable rivers which traverse it in various directions; it is surrounded with walls which include a space of 15 miles in circumference, and the streets and squares are spacious and well paved, and the cathedral and some of the other churches are admired for their architecture. The population is estimated at nearly 60,000, and the chief manufactures are linens, woollen and cotton stuffs, hats, stockings, paper, and soap; and the trade in French wines, grain, flax, and hemp, which is greatly promoted by means of inland navigation, is considerable.

GHERIAH, a sea-port town of the province of Concan in Hindostan, stands on a rocky promontory about a mile in length, and is celebrated as being the capital of Angria the pirate, who had established an independent sovereignty, and possessed a numerous fleet. It was taken in 1756 by admiral Watson and colonel Clive; the fleet was destroyed, and the town given up to the Mahrattas.

GHILAN, a province of Persia, which extends along the south western shore of the Caspian sea, is about 200 miles in length, and 150 miles in breadth, is intersected with extensive forests, and surrounded with lofty mountains. The soil is fertile in grain and some of the tropical fruits, and the silk, the culture of which furnishes employment to a large proportion of the inhabitants, and constitutes one of the chief sources of their trade, is peculiarly celebrated for its excellent quality.

GIANTS, a race of men whose stature and magnitude greatly exceed the ordinary bulk of mankind, and of whose existence the chief evidence has been derived from large bones found in the earth; but it appears pretty certain that bones of this kind belong to the larger species of quadrupeds; and, at any rate, the older accounts which have been given of these animal remains are in many cases either altogether fabulous or greatly exaggerated.

GIANTS' CAUSEWAY, a magnificent range of basaltic rocks in the county of Antrim on the north coast of Ireland, many of which have assumed a columnar form. The columns are from 25 to 30 feet in height, and in some places they are not less than 45 feet. Numerous bays or indentations of the coast are formed along this range, which is from 300 feet to 400 feet above the level of the sea. Between the ranges of the columnar basalt are interposed beds of amorphous basalt or amygdaloid, from which fine specimens of the different varieties of zeolite are obtained.

GIBBON, Edward, the historian of the Decline and Fall of the Roman Empire, was born at Putney in Surrey in 1737, was descended from a family of some antiquity in Kent, and one of his predecessors is said to have been architect to Edward III. His constitution during his infancy and boyhood was remarkably weak and tender; but from the age of fifteen till within a few years of his death he enjoyed a continued course of good health. During the early progress of his education he displayed symptoms of a quick, lively, and mathematical genius. After learning the elements of Latin with a private tutor, he was placed in his ninth year at the grammar school of Kingston-upon-Thames for about two years; from which time till he was fifteen, his education was solely superintended by an affectionate aunt.

In 1752 he was entered a gentleman-commoner of Magdalen college, Oxford, where he continued fourteen months; and this period he declares to have been the most unproductive in his life of moral and literal improvement, owing to the relaxed system of discipline which obtained at that university. At Oxford, from reading various works in defence of the church of Rome, he was led to embrace the catholic faith, the consequence of which was his immediate expulsion from the college, while his father, soon after he became acquainted with his conversion, sent him to Lausanne in Switzerland, where he put him under the care of a Mr Pavilliard, a Calvinistic minister, hoping that by his means he would be induced to renounce his new adopted creed; this change, by the exertions of that amiable divine, was at length accomplished; and Gibbon, on Christmas day 1754, partook of the communion in the protestant church of Lausanne. While at Lausanne Mr Gibbon became attached to Mademoiselle Susan Curchod, afterwards celebrated as the wife of the French minister Neckar; but his father being strongly averse to a union taking place between them, he desisted from his addresses. In the summer of 1758 he returned to England, and was kindly received by his father, who had again married during his absence. Two years after his return he entered along with his father into the Hampshire militia, in which he was appointed captain, and afterwards raised to the rank of lieutenant-colonel commandant, but resigned his command in 1770. The knowledge he acquired, in this capacity, of military tactics, he declares to have been highly useful to him in writing his Roman history. In 1761 he published a small work in French, which he had commenced in Lausanne, entitled, *Essai sur l'Etude de la Literature*, the object of which was to revive on the continent a taste for Roman and Grecian literature, a production which met with a very favourable reception. Two years after this he went back to Lausanne, visiting Paris in the way, when he became acquainted with D'Alembert, Diderot, and other learned men. After staying in Lausanne for nearly a year, he made a tour through Italy, and during his stay at Rome first formed the design of writing his celebrated History of the Roman Empire. He arrived in Britain in 1765; and soon after, with the aid of his friend M. Deyverdun of Lausanne, began to prepare a History of the Rise and Progress of Independence in Switzerland, but from various causes did not complete the work. Mr Gibbon next wrote a refutation to that hypothesis of Warburton, in his Divine Legation, regarding the sixth book of the Æneid, which represents that part of the poem as an allegory.

Soon after this appeared his first volume in quarto of the " History of the Decline and fall of the Roman Empire," and it met with such success that the first edition was sold in a few days, and a second and third impression quickly followed. These were succeeded by the attacks of the Bishop of Landaff, Taylor of Norwich, and others, upon those parts of the book which savoured of scepticism and infidelity, none of which he answered but those of Mr Davies of Oxford, in a publication entitled " A vindication of some passages,' &c.

In 1774 Mr Gibbon was returned a member of parliament for the burgh of Leskeard; and through the favour of Lord North, whom he uniformly supported, he was made one of the lords commissioners of trade and plantations, which office brought him about L.800 yearly. Having through lord North become, in the next parliament, a member for Lymington, he supported the coalition between that minister and Mr Fox.

He revisited Lausanne in 1783, with an intention of settling in that place, but returned to England about the commencement of the French revolution, and resided for the last six months of his life with lord Sheffield in London. For several years he had been subject to attacks of the gout; in the end of autumn 1793 a dropsical tumour came on, which gave rise to an inflammation; and he expired in January 1794, in the 57th year of his age.

The History of the Decline and Fall of the Roman Empire must be regarded as a most valuable accession to English literature, and places the author in the first class of historians. Industry, learning, and genius, judgment in selection, and acuteness in discrimination, talents and qualifications so essential to the writers of history, are peculiarly conspicuous in

Mr Gibbon's work; while the vigour and elegance of his style give a fascinating charm to the whole composition.

GIBRALTAR, a bold promontory, crowned with a strong fortress, in the province of Andalusia in Spain, and at the entrance into the Mediterranean sea from the Atlantic ocean. This singular rock has the wide expanse of the sea on the east; a strait, to which it has given its name, 24 miles in length and 11 in breadth, on the south; a noble bay 20 leagues in circumference on the west; and an isthmus not more than 200 yards across, connecting it with the mainland on the north. The form is oblong, about three miles in length, and nearly seven in circuit; the sides are bold slopes intermixed with perpendicular precipices; and the summit is a narrow ridge of an undulated outline, running in the direction of north and south. The highest points of the ridge are Sugar-loaf on the south, 1439 feet above the level of the sea; Rock-mortar on the north 1350 feet; and Signal-house in the centre, 1276 feet. The whole is a mass of limestone of a grey colour; the strata are from 20 to 30 feet in thickness, run in the direction of east and west, and dip at an angle of about 35 degrees; it is cavernous like other limestone rocks; and the cave of St Michael, one of the largest, is a spacious hall incrusted with spar, and supported by a stalactitical pillar. The bones which have been found in some of the hollow places of the rock are supposed to have been washed in by storms, and there to have been invested with a calcareous deposit. The heat of summer is tempered by breezes from the sea; and a Levanter, or east wind, as it is loaded with moisture, occasions a thick fog. The mountain is productive of rare plants, which have been enumerated and described by colonel James in his history of Gibraltar. A species of ape found no where else in Spain, and thence supposed to have been brought from Africa by the Moors, red-legged partridges, woodcocks, rabbits, locusts, musquitoes, centipedes, scorpions, and snakes, are the animals by which it is most commonly inhabited or visited.

History of the fortress.—This gigantic rock was called Mons Calpe by the Romans, and, with Abyla (now Ceuta) on the opposite side of the strait, constituted the famous pillars of Hercules, by which the labours of that redoubtable hero were bounded. When Spain was invaded by the Saracens about the year 725, Tarif or Turik their leader, perceiving the natural strength of this mountain, crowned it with a castle and fortification; and hence in honour of that commander the whole promontory was called Gibel Tarif, that is, the mount of Tarif, an appellation from which, by a corrupted pronunciation, Gibraltar, the modern name is derived. For a long period after this event, the rock with its fortress, as well as a great part of Spain, continued subject to the Saracens, or Moors as they were more generally denominated; and afterward, on the expulsion of the Moorish kings, it came under the power of Spain.

In 1704, Sir George Rooke, aided by the prince of Hesse, became master of this celebrated fortress, which has ever since continued in the possession of Great Britain. In 1706, Queen Anne appointed Colonel Elliot governor of the garrison, and declared Gibraltar a free port. The Spaniards in the meantime, sensible of the great loss they had sustained, made many determined, though abortive, attempts to wrest from the British their splendid conquest; the ministers of George the first agreed to restore it to Spain, but parliament would not sanction the measure; and the Spaniards, afraid of farther encroachments, raised lines and forts across the isthmus, at the distance of a mile from the rock.

While Britain was engaged in war with her American colonies, Spain, in conjunction with France, determined to make one effort more for the recovery of this important fortress; and accordingly, with this view, encamped in great force near St Roque, a town to the north of their lines. This occurred in 1779, and admonished general Elliot, the governor, to prepare for a spirited defence; and to that end to extend and strengthen all the bulwarks in the garrison. The enemy employed himself in erecting batteries, cutting off the supply of provisions, and in making frequent but inefficient attacks. The governor took every precaution to prevent a surprise, to preserve the strictest discipline, to economise his stores, and to annoy the Spaniards in their work, in all of which he was generally successful. Yet, in consequence of many months incessant labour, the batteries and approaches of the enemy assumed an aspect so formidable, that General Elliot and his officers in council deemed it necessary to interrupt his farther progress, by striking some sudden and decisive blow. A sortie was resolved upon, and was so admirably executed, that the whole works of the enemy were instantly in a blaze, and were quickly consumed to ashes; his own magazines supplying materials to sustain and accelerate the conflagration. This unlooked for, and to them disastrous event, seemed not only to stun, but to paralyze the Spaniards, and for a long time after its occurrence they remained inactive. At last they were roused to exertion, and appeared busily employed in making repairs; and in the spring of 1782 it was discovered that some new mode of attacking the garrison was in contemplation; this, from various demonstrations of the enemy, seemed evidently to be an intended attempt on the garrison from the sea, by means of floating batteries; and while preparations were made to repel this attack, when it should take place, the enemy's works on land, again in a state of forwardness, were once more destroyed by red-hot shot from the garrison.

At last the preparations for the grand attack were completed; an army of 40,000 men, ably commanded and protected by batteries, encamped on the isthmus; the combined fleets of France and Spain to the number of 47 sail of the line, with ten battering ships, carrying 212 guns, as well as a very great number of smaller craft, assembled in the bay. To resist a force so tremendous the garrison had only 7000 effective men, worn out with hard duty, and pinched by limited rations; yet determined to make a desperate stand for the honour of Great Britain. On the 13th of September 1782 the battering ships chose their station, and commenced their fire; but their cannonade, dreadful as it was, was so speedily and so effectually answered by showers of red-hot shot from the garrison, that they were all completely destroyed, with a terrible carnage of their crews. No farther attempt was made upon the garrison; it was relieved by Lord Howe about the middle of October; and on the signature of the preliminaries of peace early in 1783, the siege was raised, and has never since been resumed. The fortress, indeed, surrounded on three sides by the sea, guarded on every side, and especially towards the isthmus, by stupendous precipices, bounded by strong walls and forts, and furnished with lines, batteries, magazines, hospitals, and all other conveniences, may well be deemed impregnable. Since the siege the bulwarks have been strengthened and extended; and, in 1810, the Spanish lines and forts erected on the neutral ground were demolished.

GIBRALTAR, a town built on the northern extremity of the promontory of that name, is surrounded by strong walls, and is arranged in two parallel streets. The population, it is said, amounts to nearly 12,000, many of whom are employed in the extensive commerce of the place, and are a mixture of Spaniards, Moors, English, Jews, and of individuals of many other nations. British goods to a great amount, and in great variety, are landed and warehoused in this town to be re-shipped for a more distant market along the shores of the Mediterranean.

GILBERT, William, an experimental philosopher and physician, was a native of Colchester, and was born in 1540. Having studied at both the English universities, and travelled abroad, he graduated at some foreign university; and having settled in London, he rose to great eminence in the medical profession; was appointed physician to queen Elizabeth, and continued in the same office under her successor. He died in 1603, and was buried in Trinity-church, Colchester, where a handsome monument was erected to his memory. His collection of books, instruments, and minerals, was bequeathed to the College of Physicians.

But the name of Dr Gilbert is justly transmitted to posterity as a natural philosopher, peculiarly distinguished by the method which he had adopted of treating the subjects of his investigations by experiment and observation. This method is finely exemplified in his treatise "De Magnete, magneticisque corporibus, et de magno magnete tellure, physiologia nova." London, 1600, folio. This work is the first complete work on magnetism, and contains all that was known on the subject, beside a detail of the author's own experiments and observations, and various practical deductions important to navigation, particularly the use of the declination in discovering the latitude at sea. This treatise of Dr Gilbert's met with considerable approbation both at home and abroad, and is commended by Lord Bacon as an excellent example of an attempt to establish a philosophical theory on the base of experiment. Another work of Dr Gilbert's, "De Mundo nostro sublunari philosophia nova," was a posthumous publication, and appeared in 1651. It is an attempt to establish a new system of natural philosophy in opposition to the principles of Aristotle; and in these speculations the operation of magnetism is much employed.

GILDAS, surnamed the Wise, a British monk of the 6th century, and the oldest British writer now extant, was born about the year 520, and became a monk of Bangor, where he applied himself with great diligence and assiduity to the learning of the times. In the year 581 he wrote his "Epistola de Excidiis Britanniæ et Castigatione ordinis Ecclesiastici;" in which he laments the miseries and ruin of his countrymen, and severely censures the prevailing corruption and profligacy of manners. This singular fragment of British literature was first printed by Polydore Virgil, 1525; but the latest and best edition was published by Dr Gale in 1691, from an older and more perfect manuscript. This work is chiefly valuable on account of its antiquity, and indeed is to be regarded as little else than a literary curiosity.

GILDING.

Gilding is the art of fixing a thin coating of gold on wood, metal, or other substances, either for the purpose of ornament, or of preserving the surface thus covered from the action of the air or chemical agents. The fine colour and durable nature of gold render it the most valuable for this kind of application; and from its peculiar property of being extended by beating into very thin leaves, a given weight can be employed in covering a larger surface than an equal quantity of any other metallic substance.

Materials for gilding.—Gold is employed for gilding, either in the state of leaf-gold, which is prepared from the pure metal, or from an alloy of gold and silver in the state of amalgam, or in the form of gold-powder.

Leaf-gold.—For the purpose of being beaten into thin leaves, two ounces of the purest gold is selected; fused with some borax in a black-lead crucible; and being poured into an iron mould, previously heated and greased, is formed into a plate six or eight inches long and three quarters of an inch wide. This plate being heated red-hot to burn off the grease, is extended by forging on an anvil, and then passed between steel-rollers till it is formed into a long ribbon. This ribbon, which is as thin as paper, is cut into 150 equal pieces, each of which is forged on an anvil till it is about an inch square. These squares are then well annealed, after which they are found to weigh $6\frac{4}{10}$ grains, and they are about $\frac{1}{766}$ of an inch in thickness. The plates of gold thus formed are placed between pieces of fine vellum about four inches square, and 20 vellum leaves are placed on the outsides. The whole is then put into a case of parchment, over which is drawn another case to keep the packet perfectly tight on all sides. It is laid on a smooth block of marble, and beaten with a round-faced hammer of 16lbs. weight, and the beating is continued till the gold is extended nearly to an equal size with the vellum leaves. Each leaf of gold is then divided with a steel knife, and the 600 pieces thus formed are interlaid with pieces of ox-gut of the same dimensions as the vellum. The beating is renewed till the gold is extended to the size of the including membrane; each leaf is subdivided into four, by means of a piece of cane with a sharp edge, and the 2400 leaves thus produced are arranged into three packets with interposed membrane, and beaten with the finishing hammer till they acquire the same extent as before. The packets being taken to pieces, the gold-leaves, by means of a cane instrument and the breath, are laid flat on a leathern cushion and formed into squares with a cane frame. They are then put up in books of 25 leaves each; and to prevent them from adhering to the paper, it is previously smoothed and rubbed with red-bole. This operation shews the remarkable malleability of gold, for each of the inch square pieces is extended into 196 square inches, and every grain of gold furnishes 30.6 square inches.

Amalgam of gold.—The amalgam of gold for the purpose of gilding is prepared by heating pure quicksilver in a clean crucible, and, when it is nearly raised to the boiling point, adding one-sixth of its weight of fine gold in thin plates and heated red-hot. The mixture being kept hot for a few minutes, assumes a uniform consistence and, when it is cold, and squeezed through soft leather, the uncombined mercury is separated, and a yellowish silvery mass of the consistence of butter remains behind. This mass is either bruised in a mortar or shaken in a strong fire, with repeated portions of salt and water, till the water passes off clear. It is then fit for use, and may be kept in a well-closed phial for any length of time. It is of very essential importance that the materials of this amalgam should be quite pure, and the mercury employed should be obtained by distillation from red precipitate.

Gold powder.—In the preparation of gold powder three methods are adopted. One of the simplest processes is to introduce some gold-leaf with a little honey or thick gum-water into a glass or earthen-ware mortar, and to grind the mixture till the gold is reduced to very minute particles. The honey or the gum being washed off with a little warm water, the gold is left behind in a flaky powdery state. By another method the gold may be brought to a still minuter state of division, namely, by dissolving it in nitro-muriatic acid, and precipitating the gold by means of copper. The precipitate is digested in distilled vinegar, well-washed with water and dried, when it is in the form of a finer powder, works better, and is more easily burnished. But the finest ground gold is obtained by gradually heating the gold amalgam in an open earthen vessel, and continuing the heat till the whole of the mercury is evaporated, while the mixture is constantly stirred with a glass rod or tobacco pipe. The remaining gold is then ground with a little water, in a Wedgewood-ware mortar, and being dried is fit for use.

Gilding is executed either with or without the application of heat. As wood, paper, and other substances would be injured by the heat which is employed in gilding metals, glass, or porcelain, it is performed on the first without heat.

Gilding on wood.—Two methods are followed in gilding on wood, namely oil-gilding and burnished gilding.

Oil-gilding.—Before the wood is gilt it must be thrice coated over with a compound of lintseed-oil, white-lead, and a little spirits of turpentine; and it should be previously rubbed with glass paper or fish skin; and when dry the object must be gold sized. Mix with a brush of hog's hair softened in water, a quantity of gold size with boiled lintseed oil, making it so thin that the paint before put on will be seen through it, but still preserving its ochre colour; then lay it on sparingly with brushes of fine hog's hair. The gold size, if good, should dry in about twelve hours, though often in winter, and when newly made, it will take two or three days; but this may be remedied by mixing it with some japanners gold size, but in this case, on account of its drying quality, it must be applied quickly.

If the gold-size, on being touched, come off with the finger, it is not sufficiently dry; but if it feels clammy, and not so as to adhere, it has what is called the *tact*, or is fit for being gilt; but if it has no adhesive property, it is too dry, and must be sized over again previous to gilding. In putting on the gold, a tip rubbed with a little tallow grease is employed. When the surface of the work is large enough for whole leaves of gold, they may be taken carefully from the book, which is held in the left hand; touch the leaf to be taken out with the tip, half an inch deep opposite the sewing, then move both hands to the place to be gilt, lay the edge of the leaf upon it, and draw the book slowly away, the tip following it as it moves, and pressing the leaf upon the gold-size till each part is in contact. For parts which are not large enough for a whole leaf, a cushion is used; and having blown on it a leaf out of the book, make it lie flat and even, which can be done by puffing on its centre; and then cutting it into stripes, lay it on the parts with the tip. When gilt the surface must be pressed with a piece of cotton wool, and, to remove the loose particles of gold leaf, brushed with a dry hog's hair brush. If any of the leaf be taken off, and cannot be put on again with the brush or piece of cotton, cut down a new leaf, and with a camel's hair pencil, the tip of which is slightly moistened, attach a piece to each defective part; if the parts are over dry, they must be again sized before applying the gold.

Picture-frames and other work in oil-gilding, not to be exposed to the weather, are smoothed as if they were to be gilt in burnished gold, then rubbed with glass paper, and afterwards twice coated with size, which will answer best if stale. The gold-size is applied according to the process already described, and when gilt it must be pressed and brushed as above. To supply defects the work is coated all over, when dry, with a little weak size; each faulty part is moistened with water, and a piece of gold is applied with a pencil as before. Rub these parts when dry gently with cotton; coat the work over again with weak, and then with clear size; and the effect is much improved were the gilding completed with a coat of or-molu.

Burnished gilding.—Picture-frames or mouldings are gilt in the following manner: Three half pints of strong size are introduced into an earthen pan that will hold a quart, and when nearly boiled a quantity of the best whiting, powdered fine, is added; stir the mixture with a brush, or beat it with a piece of lath till thoroughly incorporated, and of the consistency of thick cream; then put a little of it, with a similar preparation of strong size, into a smaller pan, and having heated it in the same manner, rub it over the wood with a stiff brush in order to clean it. This is called *whitening* the work. If very foul it must be previously washed with a spunge and hot water. When burnished, the coat of whitening should be well dried; after which give it four coats of the first mixture, not so hot as the whitening, taking care that, throughout the process, one coat be dry before the other is laid on. In putting on the sixth coat, which is of the same substance, pass the brush smoothly over two feet at a time, and before the whitening is dry; rub down the flat part with a chissel, and the hollows and rounds with the fingers; and if any whitening remain on the edges when dry, it is removed with a gouge or chissel. After the seventh coat the work is smoothed with close-grained pumice-stone, cut into squares, or into pieces that fit the several mouldings; and while the pumice is used, it should be often dipped in water.

For carved work, the coats that succeed the thin white must be thinner and not so strong, and must be laid on with the brush in a less flowing way; while, for smoothing, pieces of limewood or fir, soaked in water are substituted in place of pumice, and are occasionally wrapped round with pieces of coarse linen cloth. In smoothing, too much of the whitening must not be rubbed off, else it will hurt the gilding. The work is dried either by the sun, or gently before the fire. In an earthen pan, holding half a pint, mix as much size with four times the quantity of water as will make it three-fourths full; add some yellow stone ochre; and with a brush coat the surface, rubbing it gently when dry with glass paper. Fill another pan of the same contents half full of clean size, and mix twice as much as a large walnut of burnished gold size, and with this coat the work twice. When dry, take and burnish the parts to be matted; and then let another coat of the gold size, somewhat diluted, be given; but those parts only which are to be burnished should be coated. The gold must now be laid on with a cushion knife and tip, after the process used in oil gilding; but in burnished gilding, as the gold is laid on, the small parts of the work must be moistened with camel's hair pencils; and the hollows and flats must be first gilt and dry, and when the whole is finished and dry it is burnished. These parts which are defective must be rubbed with linen wrapt round te finger to the whitening, and when dry let them be again gold-sized, gilt, and burnished. Then mix with hot water a little clean size, and, when dry from the last process, let a coat of this be laid on, and after it is again dry rub it over with cotton. In double gilding let the matted parts be again gilt, then coated with weak size, and rubbed with the cotton; and if there be faults, let them be treated as in oil gilding. After this it must get another coat of weak and afterwards a coat of clear size; and the work is finished with a coat of or-molu.

Gilding on vellum.—To apply gold leaf to vellum or paper, the surface is washed with diluted gum-water or isinglass size; in the proper state of dryness, the leaves of gold are laid on, and it is finished by burnishing with a dog's tooth or agate. Breathing on the surface when it is too dry communicates a sufficient degree of dampness.

Letters written on vellum or paper are gilt by mixing a little size with the ink, and with this mixture forming the letters; when they are dry, a slight breathing renders them so adhesive as to retain the gold-leaf with sufficient firmness by means of a little pressure. By another method, the letters are made with a brush dipt in a mixture of strong size or white-lead or chalk; and when the letters are nearly dry, the gold-leaf is laid on, and afterwards burnished. By a third process, some gold-powder is mixed up with size, and the letters are formed with a pencil.

The edges of the leaves of books are gilt while in the binder's press, by applying a composition prepared of four parts of Armenian bole and one of sugar-candy, ground together, and laying it on by means of a brush, with white of egg. When this coating is nearly dry, it is smoothed with the burnisher, and being slightly moistened with water, the gold-leaf is applied and burnished.

The impressions of gilt figures on the leather-covers of books are formed by dusting the leather with powdered rosin or mastich, and then applying the iron instrument, moderately heated, which forms the figure by the pressure of the iron on the gold-leaf; while the resinous matter is melted by the heat, the gold-leaf adheres strongly to the leather.

Gilding on glass and porcelain.—The edges of glass or porcelain vessels are gilt either by means of a simple adhesive varnish, or by the action of heat. To prepare the varnish a proportion of gum-anime, or clear amber, is dissolved in an equal weight of drying lintseed oil, and this mixture, being diluted with oil of turpentine, is applied very thin to the parts of the glass to be gilt. It is dry in about a day's time, and the vessel is placed near the fire or in a stove till the varnish become glutinous, and then a piece of gold-leaf being applied immediately adheres. It should be burnished before it is quite cooled by interposing a piece of thin paper between the gold and the burnisher. By another method, gold powder is tempered with gum-water and borax, and with a fine camel's hair pencil is applied to the clean surface of the glass. When it is quite dry the vessel is put into a stove raised to the temperature of the annealing oven. The vegetable matter is burnt off, and the vitrescible borax unites the gold strongly to the glass. After this operation it is burnished. Porcelain ware may be gilt in the same way, and, as it is less liable to be injured by the heat, the process is still more perfect.

Gilding on metal.—The simplest method of gilding on metal is, after cleaning and polishing the metal, to raise it to the temperature of melted lead, and then to cover it with a double layer of gold-leaf. The bloodstone burnisher is at first cautiously and gently applied, and the force being gradually increased, the two surfaces adhere pretty strongly; after the first layer is burnished down, a second, and sometimes a third, if very solid gilding is required, are applied in the same way. This method of gilding is very effectual, as appears from the manufacture of gilt silver or copper wire; but the tediousness of the process is an objection to its use.

Water gilding.—The more common method of covering a metallic surface with gold is by means of an amalgam, or what is usually called *water* or *wash gilding*. In gilding silver the surface must be made perfectly clean by soaking it in warm diluted muriatic acid, and afterwards washing it well with water to separate the whole of the acid. It is then dried, moderately heated, and covered with a little gold amalgam spread evenly on the surface, to which it immediately adheres. The vessel is then placed over a clear charcoal fire to drive off the mercury, and if any places appear that have escaped the amalgam, a small piece is laid on and spread with a brush. The whole of the mercury being driven off, and the surface being examined, will be found covered with a thin coating of gold. The loosely adhering particles are removed, and the surface rendered smooth and bright with a scratch-brush made of very fine brass wire; and the pale yellow colour is improved by warming the piece and smearing it over with gilder's wax, which is composed of bee's-wax, red ochre, verdigrease, and green vitriol, or alum; the wax is then burnt off over a charcoal fire, the colour of the gold is heightened, and still more so by burnishing. But, for the common gilder's wax, a mixture of equal parts of nitre, sal ammoniac, green vitriol, and verdigrease, moistened with water, is a convenient substitute.

Copper, and its alloys with zinc, are gilded nearly in the same way; but as their affinity for mercury is less than that of silver, the amalgam of gold unites with more difficulty. To obviate this inconvenience, the surface of the copper or of the alloy is first cleaned by steeping in acid, and after being washed and burnished is immersed in a solution of nitrate of mercury. The mercury unites with the copper, and strongly adheres to it; the gold amalgam is then applied, and the rest of the process is completed in the way already described.

Gilding on steel.—Gilding on steel and iron is attended with more difficulty than with other metals; for the heat requisite for simple burnishing is apt to reduce the temper of the steel too much. In this case the parts of the steel to be gilt are pencilled over with nitrate of mercury, by which they are covered with a slightly adhering coating of mercury; the amalgam is then applied, and the gilding finished according to the former process. This method has been improved by tracing the figure of the gilding on the steel with a brush dipt in a strong solution of sulphate of copper. In this way a thick plate of copper is deposited on the steel, and to this surface the amalgam is applied.

By another method steel is gilt by spreading on its surface, with a pen or fine brush, ether charged with gold separated from the muriate, and as the ether evaporates the gold remains in close contact with the steel, and the gilding is improved by burnishing. The objections to this method are the high price and volatility of the ether; but good oil of turpentine, which produces a similar decomposition of the nitromuriate of gold, may be employed as a cheaper substitute.

GILL, John, a non-conformist English divine, was born at Kettering in Northamptonshire in 1697. At an early age he displayed a wonderful capacity for learning, and an extraordinary love of reading; and although in the ardent pursuit of his studies he met with obstacles which were almost insuperable, and was obliged to devote almost his whole time to his father's business, yet he made such proficiency in learning, that before his 19th year he could read every Greek and Latin author that fell in his way, had studied logic, rhetoric, moral and natural philosophy, and had made considerable progress in the Hebrew language. In 1719 he was appointed minister of the Baptist church in Horslydown, London, in which charge he continued till his death. In 1748 he published a Commentary on the New Testament, in 3 vols. fol. a work which displays vast knowledge and erudition, and which procured for him from the university of Aberdeen the unsolicited degree of Doctor of Divinity. Besides the Commentary, he was the author of a Body of Divinity, in 3 vols. 4to. a Dissertation on the Hebrew Language, with numerous sermons and controversial treatises. He died in 1771.

GILSLAND, a watering place of Cumberland in England, is about 18 miles eastward from Carlisle, and has been of late years a good deal resorted to on account of the mineral waters. Two mineral springs have been discovered, one of which is in the immediate vicinity of the place on the banks of the river Irthing, and is of a sulphureous quality; the other is chalybeate, and both are impregnated with common salt and azotic and carbonic acid gases.

GINGER, the root of *amomum zinziber*, a native of the East Indies, and now extensively cultivated as a commercial commodity in the West Indies. See Botany.

GIOJA FLAVIO, a Neapolitan mathematician, who flourished about the beginning of the 14th century, and being acquainted with the magnetic property of iron, is said to have been the inventor of the mariners compass. This invention, it is well known, has been claimed for various nations; but in support of the claim of Gioja, it is said he marked the north point with a fleur-de-lys in honour of a branch of the royal family of France, then on the throne of Naples, and all compasses are still distinguished in this manner.

GIRGENTI, the ancient Agrigentum, is a town of Sicily, stands on a mountain about three miles distant from the sea; the streets are in general very steep, and the number of inhabitants is stated at 15,000. This place is remarkable for spacious excavations formed in the solid rock, and employed as store-houses for corn, in which it is preserved in good condition, and often exported in considerable quantities.

GIRONDE, a department of France which has the sea for its boundary on the west, the department of Landes, Lot and Garonne, and of Dordogne on the south and east, and Lower Charente on the north; includes 570 square leagues, and is watered by the rivers Dordogne and Garonne, which, by their junction as they approach the sea, form a spacious basin. Some districts of this department produce abundance of corn and wine, beside wood, cork, cattle and fish. The population is estimated at 520,000, and the trade, particularly from Bourdeaux the capital, is very considerable.

Bourdeaux, the chief town of the department, stands on the west bank of the Garonne, contains more than 100,000 inhabitants, and is 270 miles distant from Paris. See BOURDEAUX.

Libourne, is the principal place of a district, and includes a population of more than 5000. *Bazas* is also the principal place of a district, was formerly the see of a bishop, includes more than 4000 inhabitants, and is 30 miles south-east from Bourdeaux. *Blaye* stands on the right side of the river Gironde, contains 3000 inhabitants, is strongly fortified, and is 20 miles north from Bourdeaux. Before proceeding to Bourdeaux, vessels deposit their arms and cannon at Blaye. *La Reolle* is the principal place of a district, and contains more than 3000 inhabitants.

GIRVAN, a sea-port town of the district of Carrick in Ayrshire in Scotland. The population exceeds 2000; cotton and woollen manufactures have been established, and grain is exported from the neighbouring districts, but the harbour can only admit small vessels.

GLACIERS, are extensive fields of ice among the Alps. The mountains on which these masses of ice are formed, are composed of many parallel chains, of which the central is the highest, the other chains decreasing in height as they retire from it. This most elevated ridge appears covered with sharp rocks, all which, except such parts as are entirely perpendicular, are buried in perpetual ice and snow; while on each side of this chain appear fertile valleys with numerous villages. The peaks of it are covered with snow, on the declivities of which is a covering both of snow and ice, the middle parts being filled with vast masses of ice terminating in these valleys. The same phenomena appear in the lesser chains though on a smaller scale; those at the greatest distance from the central ridge having very little ice or snow upon them, and the mountains, as they diminish, appear verdant, and at last terminate in small hills and plains.

These glaciers are therefore of two kinds, the one covers the vallies in the bosom of the Alps, and are called ice valleys; the other is deposited on the sides and declivities of the mountains, and hence they are distinguished by the upper and lower glaciers. The lower glaciers are by far the most considerable, some of them being several leagues in length; the ice, according to M. Saussure, being sometimes about 600 feet thick. The upper glaciers, again, may be divided into those which clothe the summits and those which cover the sides of the Alps.

GLADIATORS were armed combatants in ancient times, (usually slaves,) who fought at Rome for the public amusement. This barbarous diversion the Romans borrowed from the Asiatics, and it seems at first to have owed its origin to the practice of sacrificing slaves at the funerals of men of rank. The first show of this kind was exhibited in Rome by M. and D. Brutus, in the year 490; and in a short time the Romans became so attached to these bloody exhibitions, that nothing was more common than for great men in the state to pay court to the people by treating them with such shows. The most memorable of these fights with which the people were entertained was one of Titus, which lasted 100 days, and one of Trajan which was continued for 123 days. Before this inhuman sport was abolished, not only slaves and freemen, but even persons of high rank and condition, took a part in it; and though a number of laws and edicts were passed by some of the emperors to restrain these amusements, the practice of them continued till the year 500, when Theodoric, king of the Goths, finally abolished them. Some idea of the barbarity of this sport may be gathered from this, that all the gladiators were obliged to swear, before commencing the combat, that they would fight to the last, and if they failed they were cruelly put to death; nay, it was even a crime to complain when they were wounded.

GLADIOLUS, CORN-FLAG, a genus of plants belonging to the Triandria class.

GLAMORGANSHIRE, the most southern of the counties of Wales, is bounded by the Bristol channel on the south and west, on the north by Caermarthen and Brecknockshires, and on the east by Monmouthshire; measures 48 miles in length and 26 in breadth, and contains 822 square miles.

Aspect and productions.—The shore from the borders of Monmouthshire to Swansea bay, has a regular and gradual sweep of a circular form, and is dry, rocky, and free from fens. Westward from Swansea bay is the remarkable peninsula of Gowerland, nearly 50 miles in circumference, formed by the channel on the east and south, and the estuary of Loughor on the west, the sea-shore of which is delightfully diversified with level beaches and romantic cliffs, while the interior abounds in deep pits and extensive ruins. A fine tract of level land of an undulated surface stretches eastward from Swansea bay along the sea-shore to the confines of Monmouthshire, and northward to the distance of ten miles from the coast, and hence called the vale of Glamorgan. This district is fertile, cultivated, and inclosed; and on the north is bounded by a country exhibiting a fine variety of hill and dale, which becomes entirely mountainous on the northern side of the county, where most of the streams by which it is traversed have their source. The river Rhymny flows along the eastern border; the Taafe is a rapid stream, the course of which is parallel to that of the Rhymny; to this, more to the west, succeeds the Elwy; and then the Neath, and the Towy or Tave. All these streams, some of which are navigable, descend from the mountains on the north, towards the channel on the south of the county. The lake of Config deserves notice on account of its retaining its freshness and purity, though situate amid sands at no great distance from the sea. At Swansea is a mineral spring impregnated with sulphate of iron. The mineral riches are equally various and valuable, consisting chiefly of limestone, coal, iron, and lead ores, besides abundance of excellent building and paving stones. Many parts of the mountain acclivities are shaded with wood; and the vale of the river Neath unites the beauty of cultivated fields and of forest scenery. The climate in the low and sheltered districts is so mild that myrtles and tender exotic plants thrive in the open air. The land is a fertile tract of arable and pasturage; and the coast abounds with the different varieties of shell-fish.

Population and employments.—In 1811 the number of inhabitants amounted to 86,000, more than the half of whom were employed in agriculture, and the rest in manufactures and commerce. The south-west of Gowerland is inhabited by the successors of a colony of Flemings, distinguished by a peculiar dialect and dress, and rarely intermarrying with the Welsh. The smelting of iron, lead, and copper, prevails greatly in several parts of the county; the working of the mines requires a good many hands; and pottery is also one of the staple manufactures of the county. The tinning of iron, for which works are established at Melin Gryffyd, is conducted on a larger scale than at any similar works in Britain. Not fewer than 2,920,000 plates are annually produced. These manufactures cause a considerable inland trade, which is facilitated by the Cardiff, Aberdare, the Neath, and the Swansea canals, as well as by good roads and rail-ways. The exports are the products of the soil, the mines, and the manufactures; and the imports consist of foreign articles of consumption, of clay for the potteries, and ores, principally that of copper, for the smelting-houses.

Curiosities and antiquities.—On the top of Curin Bryn, one of the highest mountains of South Wales, is a huge cromlech, formed chiefly of an immense mass of millstone. Upon the Taafe, not far from Caerphilly, is a stone bridge called Pont-y-Pryd, of a single arch, 140 feet in the span, and 34 feet high, which, though supposed the widest arch of masonry in the world, was planned and executed by the untaught genius of a common mason, named Edwards, a native of the country. The ruins of castles are too manifold for enumeration, as they are strewed over every part of the country. Roman roads and stations may still be traced; two miles from Cardiff is an entire camp 12 acres in extent, called Caera, occupying a hill of an oblong square. Not far from Cowbridge, the Welsh bards held an annual meeting on the 28th of May, under the patronage and at the expence of the Hensolt family. Since 1720 this musical festival has been discontinued, in consequence of the family by which it was supported having become extinct.

Divisions and towns.—The county is divided into ten hundreds, eight market towns, and 118 parishes; and is represented in parliament by two members, one of whom is returned by the county and the other by the town of Cardiff.

Cardiff, the capital, stands on the Taafe, over which there is a handsome bridge of five arches; is compact, well built, and the seat of the county assizes, of the Epiphany quarter-sessions, and of a court of record every fortnight. The population amounts to 2,457, many of whom find employment in the numerous smelting-houses. From the harbour, which admits vessels of two hundred tons burden, vast quantities of wrought iron and of tin plates are shipped annually for London, Bristol, and other places; and also of corn, salt, butter, and poultry. Ores and groceries are the principal imports. The castle built in 1080 has been recently repaired by the marquis of Bute for an occasional residence.

Caerphilly, a village in a broad valley, containing between two and three hundred inhabitants, supported by the manufacture of pig and bar iron, and of stockings and blankets, is chiefly remarkable for the ruins of the largest castle in Great Britain except that of Windsor.

Llandaff, though a bishop's see, is not a place of note in other respects. The cathedral was repaired at the expence of the late Dr Watson; but in this the Gothic and the Grecian styles of architecture have been incongruously blended. Woollen is manufactured on a small scale, and some trade in corn is carried on.

Cowbridge, situated in a pleasant bottom, and surrounded by a cultivated country, consists chiefly of one long well built street, which affords habitations to nearly 1000 souls. It has a church, town hall, and county bridewell; it subsists chiefly by travellers passing through it, and by the influx of company occasioned by the races held on a neighbouring heath; and the Easter quarter-sessions of the county are kept regularly in this town.

Bridgend, traversed by the river Ogmore, consists of a single street on each side of a strong stone bridge. The member for the county is usually elected in this town, and of late it has become the residence of many wealthy English families. Tanning, tallow chandlery, and woollen cloths are the objects which chiefly exercise the industry of its inhabitants. The blankets, and other woollen goods manufactured in this place, are sent to Witney in Oxfordshire, and sold as the production of that town.

Neath, on the river of the same name, is but indifferently built and rendered smoky by the founderies and smelting houses of the place. The church, though a plain building, contains some ancient monuments. The iron, copper, and coal works of the town and vicinity, give rise to an extensive trade, facilitated by a canal and a convenient harbour.

Swansea, on the Towy, with a population of between eight and nine thousand, consists of several streets well paved and lined with many handsome modern houses. The church and town-hall are its chief public buildings. The manufactures consist of large copper houses, breweries, an iron foundery, and a pottery. The exports are fine copper, iron, skins, paper, coal, beer, and pottery; and the imports are copper ore, timber, groceries, and cheese.

GLANDERS, a disease of horses, in which the internal membrane of the nostrils is inflamed, an increased secretion takes place from its surface, and sometimes ulcers, with a discharge of purulent matter, are formed. See Medicine, *Veterinary*.

GLANVILL, Joseph, an English divine, and ingenious writer, was born in 1636, was educated at Oxford, and during the Commonwealth was a zealous republican. After the Restoration he entered into holy orders, and being promoted to various livings, was advanced to a prebend in Worcester two years before his death, which happened in 1680.

Mr Glanvill was a very voluminous writer, and seems to have entertained just views of the method of philosophising by observation and experiment, in opposition to the doctrines of Aristotle which then prevailed. With this view he wrote a treatise, entitled "The Vanity of Dogmatising." He was, besides, the author of several other works of the same character, and having the same tendency, as well as sermons and religious tracts. But it may excite some surprise, that a writer with such enlightened views should seriously attempt to defend the possibility and existence of witchcraft. His work on this subject is entitled "Some Philosophical Considerations touching the Being of Witches and Witchcraft." The prevailing opinions of the times only can be advanced as an apology for such credulity. The discussion of these subjects involved the author in keen controversy during the greater part of his life. Another treatise by Mr Glanvill, which merits commendation for its elegance and rational views, appeared in 1660, under the the title of "Plus Ultra," or "The progress and advancement of knowledge since the days of Aristotle; in an account of some of the most remarkable late improvements of practical useful learning, to encourage philosophical endeavours, occasioned by a conference with one of the notional way."

GLARIS, one of the Swiss cantons; is about 15 leagues in length and 7 leagues in breadth; and finely diversified by lofty mountains and sheltered valleys. The whole population is estimated at 24,000, and the inhabitants are occupied in rural affairs, and chiefly in manufacturing the produce of the dairy. The cheese made in this canton is exported in considerable quantities. Manufactures of linen cloth have been introduced, and the spinning and weaving of cotton have been established since the middle of the 18th century.

GLARIS or **Glarus**, the chief town of the canton of the same name in Switzerland, stands on the river Linth, and contains a considerable population. The manufacture of cotton and woollen stuffs has been introduced, and some of the inhabitants are distinguished for their mercantile enterprise, and the extent of their commercial intercourse.

GLAS, John, the founder of the sect which bears his name, was born in 1695 at Auchtermuchty, in Fife, of which parish his father was minister; received the early part of his education at Perth, and finished his academical studies at the universities of St Andrews and Edinburgh. In 1719 he was ordained to the pastoral charge of the parish of Tealing, near Dundee; and in this charge his ministerial labours were continued for nine years. But in consequence of the opposition which he made to some points of doctrine and discipline maintained by the members of the established church, and particularly of the opinions which he held of the unlawfulness of subscription to the national covenant, a question at that time much agitated, he was deposed in 1728 from his ministerial functions. At Dundee, where he took up his residence, he formed a small congregation of those who embraced the same tenets. Soon after, chapels were erected at Perth and in other places; and the congregations thus formed adopted, in their discipline and mode of worship, the example of the apostles.

Of a family of fifteen children, the venerable pastor survived the whole; and, in all his deprivations and afflictions, invariably displayed the utmost patience and equanimity, while he expressed the most perfect resignation to the will of heaven. When the melancholy tidings of the murder of his son, captain Glas, with his wife and daughter, by the crew of the ship on their return from the Canaries, reached his ears, his composure of mind was unshaken, and in a few hours afterwards he commenced his sacred duties in public; and when the account of the execution of the murderers was communicated, he uttered the following sublime Christian sentiment: "It will be a glorious instance of divine mercy if George Glas and his murderers meet together in heaven." Mr Glas died in 1773. His works were first published in 4 vols. 8vo, in 1761; and a second edition appeared at Perth in 5 vols. in 1782.

GLAS, George, author of "The History and Conquest of the Canary Islands," was the son of the preceding John Glas, was born in 1723; seems to have possessed a very enterprising spirit, and, in his commercial intercourse with the Canary islands, collected the materials for the history alluded to. In the execution of a plan for opening up a new channel of trade between Britain and the interior of Africa, he proposed a settlement on a navigable river to the west of Senegal. Having been employed by some London merchants to search for a plant used in dyeing, on his return he laid his scheme before government, who furnished him with a ship of some force, and ample powers for the establishment of the colony. Arriving at the place, and being in want of some corn for the colony, he set out in a small vessel with his family to the Canaries, when they were all apprehended and imprisoned by the governor, agreeably to the order of the Spanish court, who were jealous that the intended settlement of Mr Glas on the Senegal would hurt their fisheries; but being after a few years liberated through the interference of the British court, he and his family took their passage in 1765 for London; but, dismal to relate, just when arrived in the Irish channel, he was treacherously murdered by the sailors in the ship, who wished to secure the money on board, while his wife and daughter were thrown overboard. The murderers were afterwards taken up and executed at Dublin.

GLASGOW, a great commercial city in Lanarkshire in Scotland, is situate on the north bank of the river Clyde, in 55° 52′ 10″ of north latitude, and 4° 15′ 51″ of west longitude, as determined by recent observations. The soil of the area is a deep sand, occupies upwards of 650 acres of ground, is nearly level, except towards the north, and extends about three miles in length, and 1½ miles in breadth.

Streets and squares.—The main street, which is more than a mile and a half in length, runs from east to west, and, at different stages of its progress, is denominated Gallowgate, Trongate, and Argyle street. The breadth in some places is 80 feet; the houses on each side are lofty and substantial; the ground story consists almost entirely of shops, many of which are richly furnished and elegantly arranged; the upper flats are occupied as warehouses and habitations; and the whole taken together presents a magnificent aspect. From this great central street many others branch off at right angles, both toward the south and the north; of these, the intersection of the Saltmarket, which descends from the main street to the river, and of the High street, which ascends from it towards the cathedral, forms the cross, and divides the town into four great departments. The town contains 125 streets, besides numerous lanes and closes; they are well paved with whinstones, and furnished on each side with a footway laid with hewn stone. They are well lighted with oil or gas. The city has three squares; St Enoch's, St Andrew's, the centre of each of which is occupied with a church dedicated to the saint from whom it has derived its name; and George's square, in which an equestrian statue of his late majesty is to be erected. The whole town is built of a whitish coloured sandstone.

Public buildings.—In enumerating the public edifices of Glasgow, the antiquity and magnificence of the cathedral or church of St Mungo entitle it to the first place. The internal length of this structure is 319 feet, the width 63 feet, and the height at the nave 90 feet; it is supported by 147 pillars, and lighted by 157 windows. It occupies an elevated situation on the west bank of the Molendinar burn or brook; and though it is not to be regarded as the most splendid, yet, having escaped the ruthless zeal of the reformers, it is certainly the most entire specimen of our ancient architecture. St Andrew's, St George's, and St John's churches, are handsome edifices of their respective orders. The Infirmary, the Public Offices, the College, the Hunterian museum, the Lunatic asylum, the Trades' hall, the Assembly-rooms, the Theatre, Hutcheson's hospital, the Observatory, the Lyceum, the Grammar school, Surgeons' hall, and Anderson's institution, are the more prominent of the public buildings, and essentially contribute to the beauty and magnificence of the town, as many of them are surmounted with steeples, domes, or towers, as they front or terminate streets, or occupy detached and conspicuous situations.

Bridges.—The Clyde is crossed by two stone bridges. The Stockwell bridge was built at the expence of bishop Rae in 1345, and has six arches. The foundation of the elegant bridge at Jamaica street was laid in 1767; it consists of seven arches, and is 500 feet long and 30 feet broad within the parapets. In 1794, Hutcheson's bridge was begun near the bottom of Saltmarket street; but in the winter of the following year it was swept away by a great flood, and has not been rebuilt. In 1803, a wooden bridge for foot-passengers, which is deservedly admired for the elegance of its design, and the simplicity of its construction, was erected near the same place. The outline forms a grand sweep of 340 feet.

Statues and monuments.—In the bishop's cemetery beneath the great altar of the cathedral, a monument was erected to the memory of St Mungo, now greatly mutilated. Bishop Law's monument is on the south side of the great altar, and is still in a state of tolerable preservation. The Stuarts of Minto, long the chief magistrates of the city, have a monument in the choir of the cathedral. In 1641, a monument to the memory of Thomas Hutcheson, one of the benevolent founders of the hospital which still bears his name, was erected in the south front of the cathedral. In the year 1735, James Macrae, formerly governor of Madras, presented to the city a metallic equestrian statue of King William III. The statue is placed on a pedestal at the Cross, and is inclosed with an iron-railing. After the lamented death of Lord Nelson, a subscription was entered into, which soon amounted to L.2075. With this sum an obelisk, 142 feet 6 inches high, of chaste proportion, was erected at the west end of the High Green. In August 1810 the upper part of the obelisk was struck and shattered with lightning; but though the stones were thrown out of their beds, and the shaft rent almost to the foundation, it still continues in the same condition without seeming to receive farther injury. Sir John Moore, a native of Glasgow, who fell on the plains of Corunna, had a monument erected to his memory by his fellow-citizens in 1819. The monument, the design of Flaxman of London, is an erect statue of bronze seven feet high, upon a pedestal of Aberdeen granite of about ten feet high; it is placed on the south side of George's square, a few feet from the railing in front of Miller's street. A marble statue of the great statesman Pitt, from the chissel of Flaxman, was set up in the town-hall in 1812. Lieutenant-colonel Cadogan, of the 71st or Glasgow regiment, has a marble monument raised to his memory in the choir of the cathedral, since his fall in the battle of Vittoria in 1813. The different cemeteries of the city are decorated with numerous monuments commemorative of individuals of private station, but of public spirit and eminent virtue.

Steeples, bells, &c.—The number and elegance of the spires of this city contribute greatly to its general beauty. The steeples, domes, and towers amount to 18,—eleven of which are furnished with bells and clocks. The large bell in the tower of the High church bears the record of its history in the following inscription:—"In the year of grace 1594, Marcus Knox, a merchant in Glasgow, zealous for the interest of the reformed religion, caused me to be fabricated in Holland for the use of his fellow-citizens of Glasgow, and placed me with solemnity in the tower of their cathedral. My function was announced by the impression on my bosom; and I was taught to proclaim the hours of unheeded time. A hundred and ninety-five years had I sounded these awful warnings when I was broken by the hands of inconsiderate and unskilful men. In the year 1790 I was cast into the furnace, refounded at London, and returned to my sacred vocation. Reader, thou shalt know a resurrection,—may it be to eternal life." The chimes in the steeple at the cross were put up in 1736, and are so arranged as to play a tune every two hours, and a separate tune for each day,—namely, on Sundays, *Easter Hymn;* Mondays, *Gilderoy;* Tuesdays, *Nancy's to the Greenwood gane;* Wednesdays, *Tweedside;* Thursdays, *The Lass of Patie's Mill;* Fridays, *The last time I came o'er the Moor;* Saturdays, *Roslin Castle.* Exclusive of these tunes, which are played from a barrel, others are performed by a musician between the hours of two and three o'clock every day, Saturdays and Sundays excepted.

Recent and designed improvements.—In the year 1786 there were only two houses in the New Town; the Building Company commenced their operations two years afterwards, and, in the course of five years, they had erected buildings to the value of L.120,000; since the year 1807, numerous dwelling-houses and places of business, and several of the churches and chapels of the city have been raised; streets netirely new have been added to the town; and narrow lanes have been widened into spacious streets.

The public park, or green, which lies on the north bank of the river, contains about 108 acres, traversed by gravel-walks, and is a great ornament to the city as well as benefit to the inhabitants. It is about to receive various essential improvements by levelling, embanking, planting, and erecting elegant buildings along its northern boundary.

Suburbs.—The extensive and populous suburbs attached to the city are, Calton, Gorbals, Bridgeton, Anderston, and Finnieston. The Bridgend, or Gorbals, is of old standing. The land on which it is built was purchased in 1650 for the sum of L.6,777, 16s. 4d. Sterling, in behalf of Hutcheson's hospital, the Town Council, and the Trades-house; and proved at first so unprofitable a bargain, owing to the destruction of the crops in the time of the civil war, that the patrons of the hospital were compelled to dismiss the poor boys. This ground has been mostly feued off, and now forms a large town, including Gorbals, Hutchesonton, and Tradeston, which are comprehended in one parish, the population of which amounts to upwards of 17,000, and is still increasing. In 1705, Bridgeton, east from the barony of Calton, was bought for the purpose of building-ground; and the whole is now nearly occupied with houses. In 1725 the village of Anderston, which is now large and populous, was begun; and, in 1770, the proprietor of Stobcross laid out the village of Finnieston. Partick, a village on the banks of the Kelvin, to the westward, is of remote antiquity; in 1568, immediately after the battle of Langside, the regent Murray gave the bakers of Glasgow the grant of a mill and mill-lands at Partick; in consequence of which the village has arisen. The granaries and other buildings erected by the Canal company at Port-Dundas proved, in like manner, the foundation of a thriving suburb.

Population.—In 1610, when the first authentic enumeration of the city was taken, the inhabitants amounted to 7,644. At the restoration of Charles II. in 1660, they had increased to 14,678. At the revolution in 1688 the number had declined to 11,948, owing to the religious troubles, as is supposed, which had previously prevailed. In 1708, soon after the Union, the number was found to be 12,766. In the course of the 18th century the population has been progressively advancing, so that in 1801 it amounted to 83,769 individuals; in 1811 it had increased to 100,749; and as the buildings since that period have been greatly augmented, it is probable that the number of souls in the city and suburbs is not over-rated at 140,000.

Ecclesiastical affairs.—Glasgow, like many other cities, seems to have derived its origin from its church establishment; for although no record of its foundation can be traced, it is yet said, that in 560 a bishoprick was endowed in the situation which it occupies, by St Mungo, or Kentigern. The structure raised by this saint for the purposes of devotion is supposed to have been of timber; but nothing certain respecting the church of Glasgow is known till the year 1115, when David prince of Cumberland re-founded the see. In 1124 this prince succeeded to the crown of Scotland, and promoted his chaplain to the bishoprick in 1129. This prelate, who was lord chancellor of the kingdom, built and adorned part of the present cathedral, and solemnly consecrated it in presence of the king in the year 1133. From this time, till the revolution in 1688, the cathedral was enlarged, ornamented, and governed by 30 Roman catholic and 14 protestant prelates in regular succession. Walter Wardlaw, bishop of Glasgow, was in 1381 raised by pope Urban VI. to the dignity of cardinal; pope Alexander VI. erected the see into an archbishoprick; and at the reformation archbishop Beaton retired to France, and took with him all the writings, documents, and plate belonging to the university of Glasgow, which he deposited in the Scotch college in Paris.

The presbytery of Glasgow was instituted immediately after the reformation, and comprehends the parishes of the town and suburbs, besides ten in the surrounding country. The Inner High church (the nave of the cathedral) was opened as a presbyterian place of worship in 1560—the Tron church in 1592—Blackfriars or College church in 1622—the Outer High church, (also a part of the cathedral) in 1648—North-west church in 1720—St Andrew's in 1763—St Enoch's in 1782—St George's, in 1807—and St John's in 1819. The Barony church, though the parish be land-ward, has always been within the royalty, first in 1595 in a part of the cathedral, and now in a separate edifice. The Gorbals is the only other suburban parish, though, as well as the Barony, it contains a population sufficient for several churches. Within the royalty are four chapels connected with the establishment; one within the college for the accommodation of the professors and their families, Glasgow.

and the students; in two of them the Gaelic language is used for the benefit of natives of the Highlands; and in the suburbs are three chapels under the inspection of the presbytery.

Dissenters.—As in other great towns of Britain, the dissenters from the Established church form a large proportion of the inhabitants of Glasgow. According to the latest survey, 44,457 of the inhabitants of the city belonged to the church, and 25,342 to the dissenters, besides 3,997 who are stated to be Roman catholics. The Episcopalians were the first religious body unconnected with the church of Scotland that met for divine service since the revolution; they have at present two chapels. The society of Friends have had a meeting in Glasgow since 1716. The seceders or Presbyterian dissenters are the most numerous. The Cameronians have one meeting; the Burghers of the Old Light one, and of the New Light two:—Antiburghers, including one about to be opened, and one in the suburbs, three:—Relief, including three in the suburbs, six. Mr Wesley, the founder of the Methodists, first visited Glasgow in 1751; and that sect has now four congregations in the town. The Glassites have had a meeting in Glasgow since 1761. The first rise of the Independents in this town was in 1770; the meeting-house was built at the expence of Mr Paterson a candlemaker; and the well known David Dale, and Mr Ferrier, who had formerly been minister of Largo in Fife, were the first elders. The Baptists erected a meeting-house in 1788, but they are not numerous. The Bereans have had a meeting in this town since 1780. The Roman catholics have had clandestine meetings for the celebration of mass in the Saltmarket from the year 1776; in 1792 Mr M'Donald was admitted as priest; and in 1817 a magnificent chapel in the Gothic style, which cost L.13,000 Sterling, and is large enough to accommodate 2000 persons, was erected. The Universalists have had a meeting in the city since 1796; the New Independents have two large congregations; and the Unitarians some years ago built a chapel, into which a minister was admitted in 1812.

Seminaries of learning.—In an account of the means of instruction which this city furnishes, the first place is due to the university, both from its antiquity and its celebrity. At the request of James II. in 1450, pope Nicholas V. issued a bull for constituting a university in the city of Glasgow, on the plan and with the privileges of that of Bononia. He afterwards granted it a charter, and exempted its members from taxes and public burdens. The Lords of Session sustained this exemption, and the bishop made the magistrates swear that they would maintain it inviolate. This seminary at first consisted of a chancellor, rector, and masters of the faculties of theology, canon-law, civil-law, and the arts. It was nearly brought to ruin at the Reformation, when the cathedral-service was suppressed, and the emoluments of the church sequestrated, and was preserved only by the seasonable support of James VI. his successors, and private individuals, and is now amply endowed. The teinds or tithes of the parishes of Govan, of Renfrew, of Kilbride, of Cadder, and of Old and New Monkland, as well as the temporalities of the bishoprick of Galloway, the teinds of L.4000 of the valued rents of the Barony parish, and some landed property, were from time to time bestowed upon the seminary. The institution at present consists of a chancellor, rector, dean of faculty, a principal, and professors of divinity, church history, oriental languages, natural philosophy, moral philosophy, logic, Greek, humanity or Latin, civil law, medicine, anatomy, practical astronomy, natural history, surgery, midwifery, chemistry, and botany. The principality and ten of the professorships are in the gift of the crown, the other situations are in that of the college. The lord-rector is chosen annually by the professors and the matriculated students. The session begins in October and ends in May; the students amount at present to about 1530; they wear red gowns, find lodging for themselves throughout the town, and each pays a fee of two guineas to every professor whom he attends. A strict discipline is enforced, and premiums distributed in common-hall upon the 1st May, to distinguish the diligent and the successful student. The great excellence of this institution consists in the public examinations, and the essays which the students are required to compose on the subjects of the different lectures. The university has the patronage of a great number of bursaries for the assistance of students. Mr Snell's foundation is very liberal; that gentleman bequeathed an estate in Warwickshire for the support of Scottish students in Baliol college, Oxford. By the rise of land that estate now affords about L.120 a-year for ten years to each of ten exhibitioners. There is another fund of about L.20 a-year during ten years for four students. A library is attached to each of the classes, for the benefit of its professor and students. Advanced students are also allowed to borrow books from the university library, which was founded more than two centuries ago, and is large and valuable. The duke of Chandois and Mr Orr of Barrowfield bequeathed each L.500 in aid of this collection, and the mathematical department was augmented by Dr Simpson. Dr William Hunter, who had studied at this university, bequeathed to it L.8000, and his museum, a very fine collection of natural history, paintings, medals, minerals, anatomical preparations, and books. The medals alone are said to be worth L.30,000. The museum is contained in an elegant building erected on purpose, in the Grecian style, at the entrance into the college garden. In 1808 this museum was first thrown open to the public.

Andersonian institution.—In 1795, Mr Anderson, late professor of natural philosophy in the university, bequeathed his valuable apparatus, museum, and library, for the purpose of introducing an extensive system of education for both sexes. The affairs of the institution were placed under the management of 81 trustees, who, in 1796, obtained a seal of cause from the magistrates and council. Natural philosophy, chemistry, materia medica, pharmacy, anatomy, mathematics, geography, and botany, are the branches taught at the institution; and the practice of lecturing on Saturdays to artizans free of all expense, chiefly on subjects connected with the application of the mechanical powers, has been introduced with much benefit.

Grammar school.---The school at which classical learning is cultivated is thought to be coeval with the cathedral. This seminary, which has always been respectable, consists of a rector and four teachers; the course of education was formerly four, now it is five years; a teacher of writing and arithmetic is attached to the establishment; the number of pupils amounts to between 500 and 600. The teachers receive salaries from the town and fees from their pupils; the fee to the rector is 15s. a-quarter, and to the other teachers 10s. 6d. from each pupil. Latin, Greek, geography, mythology, and history, are the subjects to which the attention of the youth is directed; and to excite them to diligence in their studies, prizes to the value of L.120 are distributed among them annually by the magistrates, besides a silver medal, the gift of James Ewing, Esq. to the dux of the rector's class.

Private schools.---Besides the grammar-school and the different charity and Sunday-schools, at which 6,500 children receive instruction, there are within the royalty 144 schools taught by private teachers, in which the various branches of education are communicated. Many of these teachers are students attending the university.

Literary institutions, &c.—The Literary society of the college was instituted about the middle of the 18th century; it meets once a-fortnight in the faculty-hall during the session of college, when one of its members in rotation reads an essay on some scientific or literary subject, on which critical remarks are delivered by the members.

With the view of improving machinery, a society was formed in 1802 under the name of the Glasgow Philosophical society. The members are distributed into three classes, resident, honorary, and corresponding.

The business of the Literary and Commercial society, which was instituted in 1805, is conducted in a manner similar to that of the "Literary society," except that the essays are often on commercial subjects.

Libraries.—Stirling's public library was founded in 1791, and contains 6360 volumes; and there are 413 life subscribers; the Glasgow public library was instituted in 1804, and contains 4300 volumes. The Robertsonian library was instituted in 1814, and contains nearly 4000 volumes. Circulating libraries are numerous; and book-clubs, chiefly of the working classes, have been lately extended. The news-room, into which all the popular periodical publications are admitted, may be classed with the libraries; strangers have access to this room, even without the introduction of a subscriber.

Newspapers.—Four newspapers are at present published in the city; the Journal on Wednesday; the Herald on Monday and Friday; the Courier on Tuesday, Thursday, and Saturday; and the Chronicle on the same days as the Courier. Papers of this description have been published in Glasgow since the year 1715. The publishing of books in numbers, at stated intervals, is at present carried on to a surprising extent. By a report lately drawn up for the House of Commons, it appeared that there were in Scotland 414 book hawkers, who, on an average of seven years, collected annually L.44,160 in shillings and sixpences; and that five-sixteenths of the whole sum belonged to Glasgow. The concern of a single company, in the publication of works in numbers, extends to every town of consideration in Scotland. Religion, history, and geography are the principal subjects embraced by such works.

Magistrates and police.—The municipal affairs of the city are administered by the lord provost, three merchant bailies, two trades bailies, dean of guild, convener, twelve merchant councillors, eleven trades councillors, a treasurer, and master of works, who together constitute the town-council. As in other Scots burghs, this official body elects its own successors, but a regular rotation goes on. Glasgow, in conjunction with Dumbarton, Renfrew, and Rutherglen, returns one member to the British parliament. In 1800 a separate system of police was organized, and regulated by statutory enactments. The management is vested in the provost, the bailies, the dean of guild, the convener, and 24 ward commissioners chosen by the inhabitants. The commissioners had the power of assessing the inhabitants, and the duty of watching over the concerns of every department by means of boards and committees. The act expired in 1807, and, with some alterations, was renewed for 14 years. The expence of the establishment is defrayed by the produce of an assessment on the inhabitants, levied by a scale which varies from 4d. to 1s. 3d. on the pound of rent. Houses, shops, &c. rented under L.4 are not subject to police duty: 20 officers, 80 watchmen, and 20 patrole are employed; and at present 1,091 lamps are lighted with gas, and 507 with oil. The disbursements in the year 1818 amounted to L.11,617, 8s. That department of the police which has for its object the extinction of fire, is very effective. The superintendant of fire-engines has 48 fire-men under his charge, with six powerful engines, and six carts with water butts. Numerous water-plugs are distributed through the town, and premiums are awarded to those who are active in the use of this apparatus.

Civil and criminal courts.—The magistrates hold small debt courts daily, for sums not above L.10. The conscience court is held once a week for the discussion of questions of property, service of heirs, &c. The water-bailie court is held daily for the decision of all maritime matters in the firth of Clyde. The dean of guild court meets once a fortnight, and takes cognizance of heritable rights. The criminal court is held every lawful day, and extends to all offences that do not require a trial by jury. The commissary court, formerly that of the archbishop, is held once a week, and relates to testamentary affairs and matters of scandal. The sheriff's court meets weekly, and has a jurisdiction both civil and criminal over the whole county of Lanark. The justice of peace court is held on the first Monday of every month, decides debts under L.5, and fines and penalties to any amount; its jurisdiction is confined to the lower ward of the county. A circuit court of justiciary is held in April and September, when all criminal cases, except high treason, are tried by a jury of 15 persons. The jurisdiction of the court extends over the counties of Lanark, Renfrew, and Dumbarton. Appeals in civil matters are decided by the court when the sum does not exceed L.25. A jury court is held whenever issues are transmitted from the Court of Session.

Prison.—The goal in the centre of the city having become too small, a new one, including court-houses, was erected in 1810, at the west end of the green, from a design by Mr Stark. This edifice contains spacious public offices, court-houses, 122 apartments for prisoners, sixteen large galleries for air and exercise, and two paved court yards, to which also are attached an infirmary, chapel, jailor's house, and many other conveniences.

Bridewell.—No building exclusively employed as a bridewell existed in Glasgow till 1798. It is six stories high, and contains a chapel, a work room, 105 cells; and in the wings are the public kitchen, apartments for the keeper, and several work rooms.

The Poor.—The fund for the relief of indigence is raised from various sources,—the incorporated trades, as the administrators of certain endowments; the general kirk-session, as the managers of the collections made at the church doors; the merchant-house as having public money at its disposal; the town hospital, as the depository of assessments made for the poor, and a variety of charitable institutions and benefit societies. In the year ending with 1819, the sum total of the public charities amounted to L.35,711, 6s. 7d.; of which the incorporations supplied L.2,848, 11s. 8d.; the general session, L.2,266, 4s. 0d.; the town's hospital, L.11,456, 2s. 8d., and the dissenters L.1,791, 11s. 11d. The two suburban parishes have distinct funds for their poor. The recently erected parish in the city, called St. John's, is also distinct from the others in what relates to the poor. The success of this experiment has still to be tried.

Benevolent Institutions.—The public charities of this city are numerous and well endowed, and have for their object the relief of poverty, the education of the young, and the cure of disease. The funds of the town hospital are derived chiefly from an assessment on the inhabitants. In 1819 there were 355 adults, and 48 children in the hospital, besides 212 children boarded out in various parts of the country. Hutcheson's hospital affords pensions to both men and women, who must be burgesses, the widows or daughters of burgesses, and at least fifty years of age. The number of pensioners is unlimited, and applicants of the name of Hutcheson possessing the other qualifications are preferred. The age of admission into Hutcheson's school is between seven and eight years; the boys must be sons of burgesses: After receiving a good education for four years, they are bound apprentices to such trades as they choose. Baxter's mortification; Blair's mortification; Wilson's charity; Miller's charity; the Highland society; the Trade's free school; the Flesher's free school; Coulter's mortification; M'Alpin's mortification; St Nicholas' hospital; Tennant's mortification; Mitchell's mortification; Gardner's mortification; and Hood's bequest,—have all similar objects in view. The infirmary, the Lunatic, Lock, and Magdalene asylums, the first two of which are magnificent establishments, have been of great advantage to the afflicted.

Sunday schools.—In the summer of 1819 there were within the royalty 109 Sunday schools and 4747 scholars. Some of these schools meet before and others after divine service. The teachers of the schools under the patronage of the general session have salaries.

Manufactures.—The manufactures of Glasgow cannot be traced to a very ancient date. In 1674 a soap-work company was formed, which also employed five ships in the whale-fishing trade. In 1696 a copartnery concern for rope-making was established, and, for its encouragement, a duty on all imported cordage was imposed; sugar-houses were erected long before the Union; and tanning and brewing have been carried on from an early period and on an extensive scale. After the Union the spirit for manufacturing increased, and towards the middle of the 18th century its effects were remarkably conspicuous. Linen, lawn, and cambric, continued the staple manufacture till 1785, when they were supplanted by that of fine muslins. The manufacture of green bottles was begun in 1730. Mr Harvie, at the risk of his life, brought two inkle-looms and a workman from Haerlem, an event which made Glasgow the first place in Britain where that commodity was made. Letter-press printing was introduced as early as 1630, and was carried to great perfection by R. Urie, and by the brothers Ro. and And. Foulis. Mr Wilson, professor of astronomy, introduced type-making, an art which his son and grandson carry on with success. The first Delft-work in Scotland was in Glasgow, and was begun in 1748. The distillation of spirits has been practised since 1786. Machinery of all kinds, and especially the steam-engine, are made on an extensive scale. It has been computed, that in 1818 a hundred and five millions of yards of cotton cloth were made in the town and its vicinity, the value of which was L.5,200,000, and that nearly the half of these goods were exported. Connected with the city there are 52 cotton-mills, 16 works for weaving by power, in which there are 2380 looms, 18 calico-printing works, which do business to a considerable extent. Within the city are 14 calender-houses and five lapping-houses. Brass, iron, and turret-bells are founded in the city, and all the arts and crafts which are usually required in a populous and rich community.

Commerce.—The curing and the exportation of salmon and herrings seem to have been the first branch of trade in which the citizens of Glasgow were engaged. A Mr Elphinston is said to have embarked in this business as early as the year 1420, and to have sent great quantities of salted fish to the French market. This trade was in a very flourishing state between the years 1630 and 1664. In return for their salmon and herrings, the Glasgow merchants imported from France, brandy, salt, and wines; and about the same time a good deal of iron from the Baltic. The Union opened the colonies to the

Glasgow merchants; and availing themselves of the privilege, they exported goods for the consumption of America and the West Indies, and brought back cargoes of tobacco. English bottoms were at first employed in this trade; and it was not till 1718 that a ship, the property of Glasgow, crossed the Atlantic. But this branch of commerce advanced so rapidly, that it excited the jealousy of the merchants of London, Bristol, Liverpool, and Whitehaven, which led to litigation; and at last the complaint was dismissed by the lords of the Treasury in these words: "The complaints of the merchants of London, &c. are groundless, and proceed from a spirit of envy, and not from a regard to the interest of trade or the king's revenue." From this period, sugar, rum, and cotton from the West Indies, were among the imports. This trade has been greatly increased; so that in 1815 the import of sugar exceeded 540,000 cwt.; of rum 1,251,000 gallons; and of cotton 6,530,000 lbs. The ships for this trade were 448; the tonnage 79,219, and the men employed in their navigation 4,868. These imports are exclusive of grain, hemp, tallow, timber, and other goods from the Baltic, through the great canal. In the spring of 1816, Messrs James Finlay and Company dispatched the ship Earl of Buckinghamshire, 600 tons, to Calcutta, being the first vessel from Scotland bound direct for India. Since that time other enterprising merchants of Glasgow have engaged in the same trade.

River and canals.—The Clyde, the navigable river on which this city is placed, as well as the fertile country by which it is surrounded, and which is stored with coal and other useful minerals, renders its situation very advantageous for the extended commerce to which it has now attained. The river is 140 feet broad at the west end of the town, and soon opens up into a magnificent estuary. The tide ascends two miles above the town, and has a fall between Glasgow and Port-Glasgow (near 20 miles) of three feet six inches. The quay at the Broomielaw was built immediately after the revolution, and has since been greatly extended. The deepening of the river has also been an object of attention; and the improvements are now so far completed, that vessels drawing 9½ feet water, can, in ordinary spring-tides, be brought up to the Broomielaw. Since the application of the steam-engine to navigation, numerous steam-boats ply on the Clyde; some of which go to Belfast, others to Dublin, and others to Liverpool. The harbours and docks for the Glasgow shipping are at Port-Glasgow and Greenock.

The great canal between the Forth and the Clyde was projected by Lord Frederick Campbell, to facilitate the trade from the east to the west. It was begun in 1768, and opened with great ceremony by launching a quantity of Forth water into the Clyde in 1790. It is 35 miles long, 56 feet wide at top and 27 at bottom, and nine feet deep. It has 20 locks from the Forth to Port Dundas, and is supplied with water from eight reservoirs. Six elegant track-boats, drawn each by three horses, ply daily, and in 1818 more than 95,000 persons went along the canal by this mode of conveyance. Vessels with merchandize, drawing eight feet nine inches, are brought along it from sea to sea. Stock is divided into 1297 shares, which now sell at more than L.500 each. The Monkland canal was formed to secure Glasgow a plentiful supply of coals. It is 12 miles long, 35 feet wide at the surface, about 5 feet deep, has four locks, and is supplied with water from a reservoir which covers 300 acres of ground. The Ardrossan canal has not yet extended beyond Johnston, eleven miles from Glasgow, but affords a convenient conveyance to the public, as it passes by Paisley.

Banks.—Between the years 1696 and 1733, a branch of the bank of Scotland was twice extended and as often withdrawn from Glasgow. "The Ship "Banking Company," the first in Glasgow, was organized in 1749; "the Glasgow Arms Bank" in 1753; "the Thistle Bank," in 1761; and they were soon followed by the Glasgow, Merchant, Watson's, and Thomson's banks. A branch of the Royal Bank of Scotland was sent to Glasgow in 1788, and "the Glasgow Banking Company" commenced business in 1803. There are also branches from three chartered and fourteen provincial banks; but the Arms, Merchant, and Thomson's banks have retired. A provident or savings bank was opened in Glasgow in 1815, in which deposits of one shilling and upwards are received, bearing interest at the rate of four per cent when the sum amounts to 12s. 6d. and has been a month in the bank. This institution has been productive of much good to the lower classes of society.

Coaches.—Five years after the establishment of hackney coaches in the metropolis, the magistrates of Glasgow entered into contract with William Hume, merchant in Edinburgh, to run a stage coach between these two cities. The following is an extract from the original agreement: "At Glasgow, the saxt day of August 1678, the aforesaid parties finally agreed that the said William Hume should with all diligence have in readiness ane sufficient strong coach to run betwixt Edinburgh and Glasgow, to be drawn by sax able horses, to leave Edinburgh ilk Monday morning and to return again (God willing) ilk Saturday night, the passengers to have the liberty of taking a cloak-bag for receiving their cloaths, linens, and sicklike, the burgesses of Glasgow always to have a preference to the coach; the fare from the first of March till first of September, which is considered summer weather, is to be L.4, 16s. Scots, (8s. Sterling;) during the other months, which is considered winter weather, the fare is to be L.5 Scots." In 1819 eight public coaches, each drawn by four horses, and seven drawn by two horses, depart for Glasgow every lawful day, and one coach with four horses and one with three horses depart and return three times a week. A narrow coach, capable of carrying four persons, drawn by one horse, was introduced in 1818; and, in the following year, ten of the same kind were plying on the streets.

Associations.—Under this head may be mentioned the Tontine schemes of the city. The first was instituted in 1781, and the society are the proprietors of the Tontine building and coffee-room in Trongate street. The stock was L.5350, divided into 107 shares. To the second society of this kind belongs the property of the Assembly-rooms, Ingram street; the scheme was divided in 267 shares of L.20 each. The third scheme of this kind respects buildings in Hutcheson street, and was divided into 145 shares of L.20 each. The fourth is the Glasgow Tontine society, which, with a stock of L.20,000, divided into 800 shares, became proprietors of George inn, Antigua buildings, and other property. The oldest of these schemes pays a dividend of 20, and the most recent of 6 per cent. The Annuity society of this city was the first of the kind in Scotland; and the object of its institution was to secure a fund for the support of its members in advanced age. Not fewer than 150 benefit societies, with objects nearly similar, have been established.

The Glasgow Water Company and the Cranstonhill Water Company were formed, the one in 1806, and the other in 1808, to supply the town and suburbs with water filtered from the Clyde. In 1808, "The Glasgow Society for promoting Astronomical Science," was formed; and, in 1810, an observatory was erected on Garnet-hill, at the distance of a mile north-west from the cross. The building is in the Egyptian style, is divided into three compartments, and is furnished with a complete set of instruments. In 1816, the sum of L.6000, in shares, was raised for a botanic garden; the subscribers were afterwards erected into a corporation by the Prince Regent in council; six acres of land, on the road to Partick, were purchased, which have been formed into a garden, with stoves and green-houses.

Markets.—The markets of Glasgow are extensive and well supplied. A live cattle-market was erected in 1818, which, for extent and accommodation, is exceeded only by Smithfield in London. The beef and mutton-markets, in St Andrew's lane and John's street, are the property of private individuals, as is also the fish-market in Candleriggs street; but the mutton, beef, fish, and green markets in King street, the mutton market in Bell's street, and the Bazar in Candleriggs street, are the property of the public, and under the control of the magistrates. Within the royalty there are 65 cowkeepers, who, among them, have 586 cows. Mr Harley, whose dairy-management is so much admired, keeps 160 cows. From June in 1817 to June 1818, no fewer than 109,803 head of cattle were slaughtered,—the value of which was estimated at L.400,000.

GLASS MANUFACTURE.

INTRODUCTION.

Nature and properties of Glass.—The beautiful substance denominated **GLASS** is an artificial compound, formed by melting together certain siliceous or flinty bodies and a fixed alkali. In its usual state, and at ordinary temperatures, it is hard, brittle, elastic, and sonorous, is one of the most perfect non-conductors of electricity, and a bad conductor of heat; possesses considerable refractive power on the rays of light, and resists the operation of all known chemical agents, except caloric, fluoric acid, and strong caustic alkali. It is usually transparent and colourless, and when made of the purest materials displays a brilliancy and lustre inferior only to those of the precious gems. But it is capable of receiving tints of various colours, from a faint yellow to a deep violet, without losing its power of transmitting the rays of light; and it is often seen perfectly opaque. When gradually heated to redness, glass becomes soft and malleable, and in a still higher degree of heat it may be *welded* or united to another piece equally heated. It may then be cut with scissars, twisted and fashioned into any shape by means of proper tools. In a state of fusion it is very tenacious, and so ductile that it may be blown into a globe whose sides are thinner than paper, or spun into a thread more slender than the finest hair. While fluid it may be cast in moulds, or extended into plates of any size or thickness.

Varieties.—Glass is of various qualities, and has received various denominations, according to its appearance, the purity of its ingredients, or the nicety of its manufacture. Common glass is distinguished into *bottle glass*, of a coarse texture, and dull green colour; *broad window glass*, forming a circular plate, and usually having a light green tinge; *crown glass*, also used for windows, thicker than the former and free from colour; *table glass*, differing from the last chiefly in the mode of its formation; *flint glass, or crystal*, made of finer materials than any yet mentioned, and thicker in substance than the last three kinds, used for making the finer drinking vessels, decanters, case bottles, dishes and other domestic utensils; and *plate glass*, forming flat plates of various sizes, and of uniform and often considerable thickness, made from the best materials and in the nicest manner, used for plane mirrors, carriage windows, and for windows in the houses of the opulent, or the shops and counting-houses of the highest order of tradesmen and merchants. From glass of the same quality with the last, but cast in a different form, is also made a great variety of lenses, mirrors, and other optical and philosophical apparatus.

A peculiar kind of glass, more fusible than the common, of various colours, and usually opaque, is called *enamel*, and is employed for covering the surface of metallic plates, in forming the dial-plates of watches, constructing ornamented watch-cases, and preparing a ground for certain paintings.

A third kind of glass, possessing superior brilliancy and lustre, made with peculiar care from the purest siliceous stone and other materials which will be afterwards mentioned, and coloured, when necessary, to resemble the ruby, the topaz, and other precious stones, constitutes *paste* employed in making artificial gems.

Uses of glass.—Perhaps no substance in nature, or production of art, is more extensively useful, and therefore more valuable, than glass. To estimate the importance of this manufacture, it is proper to take a comprehensive view of the various uses to which its products are applied; for, though many of these uses are very familiar, few persons can form a just idea of them all. Besides the more obvious purposes of forming panes for windows, coverings for pictures, transparent cases for specimens of natural history, plates for looking-glasses, vessels for holding liquors, drinking vessels, dishes for fruit, salt, pickles, and preserves, jars for flowers, coverings and chimnies for lamps, drops and other ornaments for chandeliers, glasses for clocks and watches, —the chemist, the astronomer, the experimental philosopher, the naturalist, the navigator, and several artists and manufacturers, are indebted to glass for the success of their operations, and the extent of their discoveries. By his retorts, receivers, gas-holders, connecting tubes, and numberless other pieces of transparent apparatus, the chemist is enabled to observe, and to exhibit many of those striking phenomena that render his science so fascinating, and his art so useful. By means of his telescope the astronomer transports himself beyond this earthly sphere, penetrates the depths of space, and visits worlds unseen by vulgar eyes; while the philosopher with his prism, his air-pump, his electrifying machine, decomposes the rays of the sun, illustrates the uses of the atmosphere, and, like another Prometheus, brings down fire from heaven, and more successfully than Salmoneus imitates the thunder. Unaided by the microscope, the investigator of nature's works could take but a very superficial view of the minuter plants and animals that fall under his notice, and would be entirely ignorant of thousands which are invisible to the naked eye. Without his quadrant and his perspective glass, the sailor would often be in the most imminent danger of losing his vessel and his life, for want of knowing his situation in the boundless ocean, or the nature of those objects which appear in the direction of his course. Not to dwell on the utility of the magnifying-glass to the watch-maker, the jeweller, and the engraver—and of the thermometer to the brewer, the dyer, and several other manufacturers—of how many pleasures and comforts would aged and near-sighted persons be deprived, were it not for the useful invention of spectacles!

But these are not all the uses of glass. In the form of buttons, buckles, broaches, ear-rings, beads, and bugles, it is employed as an ornamental article of dress; and with the same view, in the more elevated state of *paste*, it constitutes necklaces, bracelets, and other pieces of jewellery, in which only the experienced judgment of a connoisseur can distinguish it from those precious gems which it is intended to imitate. Indeed, so successful have these imitations sometimes been, that even connoisseurs have been deceived into the belief that they have possessed themselves of a valuable diamond, ruby, or emerald, till the application of certain tests have proved that they had purchased only a beautiful and showy bauble. So beautiful are even the finer kinds of common glass, that (to adopt the language of a popular writer,) "If a person ignorant of this manufacture were to see one of our capital glass shops, he would think all the treasures of Golconda centered there, and that every drop of cut glass was worth a prince's ransom."

In this treatise will be given a brief history of the origin and progress of the glass manufacture, particularly in Britain; an account of the materials employed in the composition of glass, and of the works and apparatus by means of which the manufacture is conducted; a description of the most approved processes for making the several varieties of glass; the preparation and application of enamel; the most successful methods of imitating precious stones; and a statement of the principles according to which the phenomena connected with this subject are explained.

Chap. I. History of the Glass Manufacture.

The art of making glass is not of very high antiquity, though it appears to have been practised among the Phœnicians some centuries before the Christian era. Pliny's account of its origin is very probable; that the crew of a merchant vessel which had entered the river Belus, in Syria, having gone on shore, kindled a fire on the sand and supported the vessel in which they were to cook some provisions on blocks of *nitre* (by which name the ancients distinguished fossil alkali) that made part of their cargo, and after their meal observed certain masses of a pellucid substance formed by the union of the alkali, melted by the heat, with the sand on which it rested. As the river Belus was not more than ten leagues from Tyre, the inhabitants of that commercial city, who are known to have manufactured and traded in glass above 2000 years ago, might easily have taken advantage of such an accidental discovery, which would doubtless be reported in the neighbourhood, and would thus acquire the art of forming so curious and beautiful a substance.

Among the Greeks and Romans glass was used for several purposes, particularly for drinking cups and mirrors; but glass windows were unknown till the decline of the Roman empire. The story related by Petronius and other Roman writers, of malleable glass having been invented in the reign of the emperor Tiberius, and that this discovery was rewarded with the death or imprisonment of the inventor, is discredited by many, and explained by others as alluding to the malleability of glass when heated. It appears from plates of glass found in the ruins of Herculaneum, that this substance was in frequent use, probably as forming mirrors, previous to the year 70 after Christ.

Glass is supposed to have been first used for windows towards the end of the third century in Italy, where this manufacture was almost exclusively carried on for some centuries after the commencement of the Christian era. Venice was particularly celebrated for its glass, and in that city plate glass for mirrors was first made. From Italy the manufacture was introduced into France, and soon made a rapid progress; but so late as the year 1300, glass mirrors were made only at Venice. The most extensive and distinguished manufactory of glass in France is that of St. Gobins in Picardy, established by Louis XIV., where, since 1668, plates for mirrors of a large size, and of a quality equal to those of Venice, have been formed.

It has been supposed, from the accounts given by Tacitus of glass vessels found in Britain when it was visited by the Romans, that the ancient Britons understood and practised the art of making glass; but this supposition is highly improbable, and it is more likely that those vessels had been brought to Britain by the Phœnicians in exchange for the tin and other metals for which they traded to this island. If the art of glass-making had been known in Britain previous to the Roman invasions, it was so completely lost that glass utensils were scarcely known there in the 7th century, and even church windows were not glazed till 674, when Benedict, abbot of Wearmouth, brought into this country some foreign artists, established a manufactory of glass, and furnished his church and monastery with glass windows. For some centuries after this period, the use of glass windows in private houses, even of the nobility, was unknown, and it was not till the end of the 12th century that this luxury was generally introduced among the higher ranks. Even so late as 1567, it was usual when the family of a nobleman left the house or castle, and removed to another dwelling, to take out the glass panes from the windows, and deposit them in some secure place to prevent their being broken during the absence of the owner, as appears from the survey of Alnwick castle in Northumberland, dated in that year. But ten years before, two manufactories of glass had been established in the Savoy and at Crutchet-friars in London, and they were soon followed by others in different parts of the kingdom. The art was materially improved in 1670, in consequence of the introduction of some Venetian artists by the duke of Buckingham; and in 1673 plate-glass was employed for the windows of carriages. At first, the manufacture of glass was confined chiefly to the making of glass plates for windows, and probably the blowing of common bottles, for little mention is made of glass drinking vessels manufactured in England till 1690.

The first manufacture of glass in Scotland is said to have been established at Fortrose in the reign of James VI. Others were afterwards formed at Wemyss in Fifeshire, and at Prestonpans; and during the 18th century glass-works of considerable extent were constructed at Leith, Glasgow, and Dumbarton, which still continue to furnish considerable quantities of bottle, flint, or window glass.

The principal glass manufactories in England are those of London, Newcastle, Stourbridge, Sunderland, Liverpool, and Bristol; and since the year 1773, when a plate-glass manufactory was established at St Helens in Lancashire, glass plates of excellent quality, and of a large size, are made in this country, especially at London and Liverpool. The annual value of the glass manufacture in England has been estimated at L.1,000,000 Sterling, and is supposed to employ from 30,000 to 40,000 persons.

For many ages after the discovery of glass, it is probable that it was always more or less coloured; but as the colours were dull and unpleasing, it became an interesting object either to procure glass that was perfectly colourless, or to tinge it of a bright and lively hue. The latter object was attained sooner than the former. It appears from the writings of Pliny, that in his time glass coloured to resemble hyacinths and sapphires was made; and the emperor Adrian obtained from the priests at Alexandria several beautifully coloured glass cups, which he sent to Rome to be used on occasions of festivity. That the art of making artificial gems of great beauty was known in Rome many centuries ago, is proved by ancient specimens still preserved there; especially two, a chrysolite and an emerald in the Victorian museum. The gem most difficult of imitation was the ruby; but in the 17th century a method was discovered of imparting to paste a rich and brilliant ruby colour. The art of imitating the precious gems has been described by Neri, in his *Arte Vitraria*, translated into Latin, with additional information by Kunkel, into English by Merret, and into French by baron Holbach. It was improved by Orschal in his *Sol sine Veste*, (also translated in baron Holbach's *Art de la Verrerie*) and still later by M. Fontanieu in his *L'Art de faire les Cristaux Colorès imitans les Pierres Precieuses*, published at Paris in 1778. A very ingenious and successful method of imitating pearls with glass beads was contrived by M. Jacquin about the beginning of the 18th century, and an abstract of it will be given in a subsequent chapter of this treatise.

Staining, or what is called painting on glass, so much employed in the decoration of church and convent windows in the days of papal supremacy, was exercised in greatest perfection during the middle ages, and was afterwards entirely lost in Europe, though it was retained in Asiatic Turkey, especially at Smyrna. The art has been lately revived; but the modern specimens of painted glass are not yet equal to those of former times.

CHAP. II. OF THE MATERIALS EMPLOYED IN THE MANUFACTURE OF GLASS.

Of the materials employed in this manufacture, some are essential in the composition of glass, while others act as useful assistants, correctors, or modifying ingredients.

The essential component ingredients of glass are siliceous earth in some form, and a fixed alkali; but both of them are used in different states, and of various qualities, according to the fineness of the glass, or the purposes to which it is to be applied.

Sand constitutes the most convenient form in which siliceous earth can be employed for making glass, as it is easily obtained, and is already in a state of necessary comminution. It must be always collected from the sea-shore, or from the beds of rivers, as pit-sand is found unfit for the purposes of glass-making. The finest sea-sand is used for flint and plate-glass, and certain places are particulary celebrated as furnishing the best, particularly Lynn on the coast of Norfolk, Maidstone in Kent, and Alum bay near Yarmouth, in the Isle of Wight. The last is in such high estimation, that large quantities are annually shipped for the use of the glass-makers, and it sells at twelve shillings per ton. Coarse sand, proper for making bottle-glass, is collected abundantly from the Thames about Woolwich. It is said that very fine white sand may be obtained on the coast of some of the Hebrides.

Materials.

Before the sand is applied to the making of glass, it requires clearing from its impurities by washing; and if it be very coarse, it is proper to reduce it to a finer grain by heating it in a crucible and throwing it into water. For the finer glass, the sand is also sifted through sieves of the due degree of fineness.

Formerly compact siliceous stone, in the form of quartz, pebbles, or flint, was employed in the manufacture of the finer glass, and it was prepared by calcining and grinding in proper mills. A variety of quartz, called by the Italians *torso*, was long used; and a flinty pebble, called *cuogola*, formed a principal ingredient in the Venetian glass. The purest rock-crystal is still employed in making paste to imitate the precious gems.

The alkali necessary to reduce the siliceous earth to the vitrified state may be either of the vegetable or fossil kind, either potash or soda. The latter was for a long time exclusively employed, but late experience has shewn the former to be best fitted for making flint-glass, and it is probably equally serviceable in the manufacture of plate-glass.

Soda is most commonly used in combination with carbonic acid, or in the state of a subcarbonate, under the forms of *barilla* for the finest glass, of *kelp* for window-glass, or of *soap-boiler's waste* for coarse or bottle-glass. This last substance is an impure mixture of carbonate of lime with sulphate and muriate of soda, and these acting on each other the soda is reduced to a state fit for making glass. Spanish barilla and Orkney kelp are preferred to all others for this manufacture, as they contain the soda in a purer state, and especially most free from admixture with iron. But the purest soda is that obtained by the decomposition of the residuum of the bleachers, which contains sulphate of soda, by means of acetate of lime, litharge, or charcoal, or by decomposing sea-salt, (muriate of soda,) by means of potashes or subcarbonate of potash. In this latter way the soda used in making plate-glass is usually obtained. Both salts in a state of solution are mixed together, and part of the muriate of potash thence resulting is separated by early crystallization, after which the remaining liquor is evaporated to dryness, and the solid salt kept for use. Soda is thought preferable to potash, as making a harder glass, and therefore more fit for plate and window-glass, and for chemical apparatus. A very hard glass has been formed by combining siliceous earth with *borax*, (sub-borate of soda;) but a very great heat is required for that purpose.

Potash, in the state of subcarbonate, as contained in the *pearl-ashes* of commerce, is used chiefly in the making of flint-glass. Before being thus employed, it is dissolved in warm water, allowed to settle that the impurities may subside, then filtered and evaporated to dryness. By this process the best American or Russian pearl-ash usually loses about 30 per cent of its weight.

Lime, an earth nearly allied to the alkalies, is sometimes added to the principal ingredients, especially in the manufacture of plate-glass. It is used in the state of quicklime, and is said to render the glass more capable of preserving its fluidity in casting, as well as easier to be cut. It should be prepared from limestone rather than from chalk, and the limestone of Gibraltar is preferred.

Materials.

Nitre is employed occasionally, with the view of consuming any inflammable or carbonaceous matters with which the ingredients may be contaminated, and which would injure the appearance and transparency of the glass.

Certain substances, chiefly metallic oxides, are employed in the making of the finer kinds of glass, to promote the melting of the siliceous earth; to give the glass a greater refractive power; to render it easier to be cut; to enable it to receive a higher polish, or to display more lustre; and to deprive it of colouring matter.

The *oxides of lead* answer most of these purposes in an eminent degree, and are therefore largely used in the manufacture of flint-glass. The red oxide, commonly called *red lead*, and the semi-vitreous oxide (*litharge*), are generally chosen as the best.

Black oxide of manganese is added in small quantity for the purpose of destroying carbonaceous colouring matters by means of its abundant oxygen, which, combining with those matters, carries them off in the form of carbonic acid. When the oxide is in a high state of oxidation, or has been used in too great quantity, it imparts to the glass a purple tinge; but where this is not intended, it may be avoided by introducing into the melted matter a piece of wood, the burning of which carries off the superabundant oxygen, and prevents the colour. But manganese is often used with the view of giving to glass a dark colour, which is purple, violet, or even an opaque black, according to the quantity employed.

White oxide of arsenic is occasionally added as a discharger of colour, especially when it is suspected that the materials have not been properly prepared previous to the operation of melting. But when the glass contains an excess of alkali, which sometimes happens with flint-glass, it is liable to be acted on by acids, and then the arsenic may also be dissolved; and thus a poisonous quality may be imparted to the wine or vinegar kept in vessels made of such glass. Hence the general use of arsenic is to be deprecated.

Many metallic oxides, besides those already mentioned, are used for tinging glass of various colours. Thus, with oxide of cobalt, glass is coloured blue; with oxide of copper, green; with glass of antimony, yellow; with oxide of iron, a yellowish green or a red; and with precipitated oxide of gold, a bright ruby red. But certain niceties must be observed in the preparation of these oxides, particularly in colouring fine crystal to imitate gems, and these niceties shall be here explained.

The *cobalt ore* commonly used in making blue glass, is generally contaminated with arsenic, iron, and bismuth. It is freed from the first by calcination or roasting, and from the others by sublimation, after mixing it with muriate of ammonia (*sal ammoniac*,) the iron and bismuth rising in vapour with the salt; and this sublimation is repeated with fresh ammoniacal salt as long as the latter assumes a yellow tinge.

Copper, if only slightly oxidated, produces only a brownish-red glass; to enable it to impart a green colour, it must be fully oxidated.

Red oxide of iron, prepared in the usual way by calcination or precipitation, gives to glass a yellowish-green colour. For producing a fine red, it must be digested with nitrous acid, and the acid distilled off two or three times; after which the dry oxide is washed with spirit of wine, and then with distilled water, and dried for use.

The *oxide of gold*, by which a bright ruby-red is given to glass, is that called the *precipitate of cassius*, and is thus prepared: A quantity of pure gold is dissolved in nitro-muriatic acid (*aqua regia*), made with three parts of nitrous acid and one part of muriatic, and the solution is distilled in a glass-retort, placed in hot sand or ashes till the acid is evaporated. When the retort is cool, fresh acid is poured on the gold, and distilled off as before; and this operation is twice repeated. After the gold is thus completely oxidated, successive portions of liquid carbonate of potash (salt of tartar which has been suffered to run to fluidity by deliquescence) are added till all effervescence ceases. When the acid left in the oxide has been thus neutralized, the fluid is removed by distillation, and the powder well washed with warm water by shaking in a deep vessel which will allow it to precipitate on settling. The precipitate is of a brown or yellow colour, and is dried for use.

Glass is also coloured white and other opaque shades in the preparation of enamel. The opaque white is produced by a mixture of the oxides of tin and lead, prepared by calcining those two metals together in due proportions, to be afterwards described in the chapter on Enamel.

CHAP. III. OF THE APPARATUS EMPLOYED IN THE MANUFACTURE OF GLASS.

THE apartment in which glass is made is called a *glass-house*, and in large establishments several of these houses are constructed within the same inclosure. It is of a conical shape, usually from 60 to 100 feet high, and from 80 to 50 feet in diameter at its broadest part. An arched vault extends across the base from one side to the other; and over the middle of this is constructed the principal furnace. The vault is of considerable size, so as to admit of barrows being wheeled through it to carry off rubbish; and it affords a draft of air from below to increase the heat of the furnace.

The *furnaces* differ in construction and situation, according to the purposes to which they are to be applied. Some are for calcining the materials before they are submitted to fusion, and are usually connected with the centre or fusing furnace, and receive their heat from thence. This principal furnace is generally an oblong arched chamber, with a grate in the middle, and a raised bank round it, or one on each side, on which the melting-pots are placed. A single bank round the grate, capable of holding six pots, is usually constructed for the flint-glass furnace; but in the bottle and crown-glass works, there is a bank on each side the grate with room for two or three pots. In the sides of the furnace are left several open spaces, for admitting fuel and taking out the melted glass.

With the melting-furnace other furnaces frequently communicate, and are built at the corners of the former; but sometimes there is a separate reverberatory furnace for preparing the materials for being fused. For calcining the ingredients of crown-glass, this furnace is about six feet square, and has an arched roof about two feet high, and its floor is raised above the ground rather more than three feet, that the workmen may the more readily stir and remove its contents. The common reverberatory furnace for plate-glass consists of two contiguous domes with flat floors, on which the materials are laid, and a furnace between them, the flame of which communicates to both; but in the French plate-glass-works the melting-furnace has four others, one at each corner communicating with it; some serving to bake the pots and other earthen apparatus, while others are employed in calcining the materials, and they are all heated by one furnace in the centre.

Besides the furnaces already noticed, the manufacture of crown or window-glass requires one called the *whirling*-furnace, with a large round mouth, and a brick-wall built before the half of it to screen the workmen from the heat; and in every branch of the manufacture, particular furnaces or *ovens* are appropriated to the reception of the articles when formed for the purpose of *annealing*.

All these furnaces are constructed with bricks made from that particular compact argillaceous earth called *fire-clay*, which supports a higher degree of heat than the soft clay of which common bricks are made. This fire-clay is found in abundance at Portobello and Joppa, in the neighbourhood of Edinburgh.

The fuel most proper for glass-house furnaces is wood, because it admits of a more regular intensity of heat being kept up without fear of injuring the glass by a mixture of carbonaceous particles. Where wood is abundant, as in France, the manufacturer of glass always melts the materials in open pots, and is thus enabled to raise the *metal* to a greater heat and to make a harder glass. But in the British manufactories and others, where pit-coal is employed, it is necessary, in making the finer glass, to use covered pots, in which the heat cannot be raised to such an intensity, so that a greater quantity of flux is required, and the glass is proportionally softer.

The melting pots, or crucibles for fusing the materials, require the greatest attention in their composition and construction. They must be made of a substance capable of resisting the strongest heat, not liable to be acted on by the substances employed for fusing the siliceous earth, and sufficiently ductile to be formed into, and retain the required shape. All these qualities are possessed in an eminent degree by a certain variety of clay found most abundantly at Stourbridge in Worcestershire; and it is said that a clay of the same nature occurs on Mr Hamilton's ground at Joppa near Portobello. Stourbridge clay is exported to all the glass-making establishments in the kingdom, and usually sells at the rate of L.6 per ton. To prepare the clay for moulding into pots, it is sorted, brushed, ground in a mill, and sifted; then mixed with warm water, and well tramped and kneaded in a cistern till it be reduced to a thick coherent mass. It is usual to grind pieces of old broken pots and mix the powder in the ductile clay in the proportion of about one-fourth, which is thought to strengthen the pots, and to enable them more completely to resist the fire. The pots may be formed in moulds or fashioned by the hand. They are of very considerable size, being generally about forty inches high, the same in diameter at the top, and three or four inches thick in their sides, while at the bottom they are commonly not more than thirty inches broad, so that they are shaped like an inverted cone with the point cut off. Sometimes they are cylindrical. In general they are open; but when used in the melting of flint-glass, they are closed at the top, and have an opening in the side, which is occasionally shut with a stopper that only allows the escape of a scum which is called the *sandiver.* Great care is taken to dry these pots gradually in the shade so that they may not crack, and afterwards they are placed in a furnace and submitted to a heat increasing by degrees for four or five days to the greatest intensity, or what is called a white heat, when they are suffered gradually to cool in an annealing oven, and then removed to their place in the melting furnace.

Without at present minutely describing the various apparatus employed in glass-houses, it is sufficient to remark, that *rakes* and *ladles* are used for stiring the materials and taking out the melted glass; hollow tubes of iron, called *blowpipes,* for inflating the melted matter, so as to make it of equal thickness; solid iron-rods for holding or supporting the piece of glass during its formation; *moulds,* for giving to bottles, and some other articles, an uniform size and shape; *tables* of stone or iron, for rolling the glass while under the hands of the workman, or for casting it into plates; *scissars* and *shears,* for cutting the glass while soft and malleable; *tongs* or *nippers,* for removing the articles to the annealing furnace, and for conveying vessels containing melted glass from one place to another; and, in the plate-glass works, a *cistern* for holding the fluid glass and pouring it on the casting table.

CHAP. IV. OF THE PROCESSES FOR MAKING GLASS.

In the manufacture of glass certain general processes are common to all the several kinds, and to these processes the different articles manufactured must be subjected before they are fit for use. These processes shall be first described.

SECT. I. *Of the General Processes in the Glass Manufacture.*

1. *Fritting.*—When the materials of which glass is composed have been properly purified and mixed together, they are often submitted to a moderate but increasing heat in the calcining furnace for several hours, to bring them into more intimate union without reducing them to the fluid state. The compound matter thus half-formed is denominated *frit,* and it is often prepared several months before it is wanted for melting into glass, as it is thought better for being old. This operation of *fritting,* as it is called, requires great attention. The heat must be so regulated that the alkali may not be driven off in vapour, while it is sufficient to expel any aqueous or gaseous matters that may be contained in the materials. Great care must also be taken, by constant stirring, that the materials do not conglomerate into lumps; in which case much of the sand or other siliceous earth would escape the due action of the fire, and not be equally or sufficiently united with the alkali. When the whole is reduced to the state of a soft paste without being absolutely melted, it is made up into cakes, to be kept till wanted for melting.

Fritting is a very necessary operation in certain parts of the glass manufacture; for if the materials were put at once into the melting pots under the great heat necessary for melting the sand, the alkali would be dissipated before it had time to act on the siliceous earth. In the flint and bottle glass-works, the sand and alkali are usually calcined separately, and not converted into frit.

2. *Fusion.*—When a *batch* of glass is to be made the pots are placed in the melting furnace and moderately heated, and the frit or the ingredients previously mixed together are thrown in by shovels full, adding more as the former portions melt, till the pot is full to the brim, or, in covered pots, to the edge of the opening, so that when the impurities rise to the surface they may flow off in the state of *sandiver.* After the whole contents of the pot are melted, the heat is raised to the degree required, and kept up till the metal is fine, clear, and properly fluid, free from specks of sand and bubbles of air. Many hours are commonly necessary to produce these effects according to the nature and fusibility of the materials. When the metal is sufficiently fused and purified, the heat is lowered to what is called a *working* heat by closing the doors of the furnace. In fusing glass it is usual to fill up the pots with a certain proportion of old broken glass, which is thus rendered as useful as at first.

3. *Blowing.*—Except in a few instances, where the glass is brought to the required form by casting, all the articles made of glass are formed by *blowing.* The blow-pipe is an iron rod about five feet long, rough and flattened at one end and smooth and rounded at the other, perforated through its whole length with a cavity about one-eighth of an inch in diameter. The workman dips the flattened end of this pipe in the pot of metal, (as the melted glass is called,) and some of it adheres to the pipe, appearing like a piece of red hot iron. He dips in the pipe successively till he has collected, or *gathered,* as it is termed, as much *metal* as is sufficient for the intended piece. The pipe thus charged is commonly transferred from the gatherer to the *blower,* who with a moderate exertion of his breath inflates the mass of melted matter into a globular or oblong hollow ball, rolling it occasionally on an iron plate or table, and heating it again if necessary, at the mouth of the furnace, till it has acquired the proper size and form, when it is separated from the pipe by touching it while hot with a cold iron, which cracks it neatly round as if cut with a sharp instrument.

No person who has not witnessed this operation can conceive with what ease, dexterity and expedition the workmen form all the different articles by blowing, with the aid of certain tools for extending, bending, or otherwise fashioning the softened metal. The particular manipulations will be described in the subsequent sections.

4. *Annealing.*—As soon as any article of glass is formed by blowing, moulding, or casting, it is immediately carried away by one of the boys, who attend for that purpose, to the *lier* or annealing oven, to remain for several hours in a gradually decreasing heat, by which process the pieces are rendered less liable to break from slight blows, or to crack from sudden vicissitudes of heat and cold. The annealing oven is a long low chamber furnished with a number of iron pans called *lier-pans* or *fraiches*, in which the articles are placed; and the heat is so managed, by placing the fire next the entrance, that different degrees are found in the same oven. The trays next the entrance are first filled, and as fresh articles are introduced, the former are pushed back to a cooler part of the oven till they arrive at the further end. Great care is taken in carrying and placing the goods, that they be not bent or warped out of their proper shape; and this is particularly necessary with plate and window glass, the latter of which is sometimes seen with a very irregular surface. When the goods are all placed in the oven, the door is kept close shut, and the fire is allowed gradually to go out; and when the oven is cool its contents are removed to the ware-room.

The heat of the annealing oven must be so regulated that the articles placed in it may neither be softened so as to lose their shape, nor cooled so as to lose the benefit of the process. On the proper annealing of glass depend many of its most valuable properties. When suffered to cool hastily it becomes so brittle as to break with the slightest touch, and sometimes to burst spontaneously. But the singular properties of unannealed glass will be considered in another chapter.

5. *Grinding and cutting.*—Many articles made of glass require to be ground, either to remove any inequalities upon their surface, to reduce the surface to a particular form, or to engrave on it certain letters or devices. Such pieces as can conveniently be held in the hand are ground on small stones of fine grit fixed on axles, which are generally set in motion by means of a steam engine, and the edges of the several stones are thicker or thinner, or are moulded into a convex or concave form, according to the impression they are intended to make upon the glass. Thus the fluting often seen on wine-decanters, is produced by a convex edge, but the rounded prominences or rings are generally formed separately and stuck on while the glass is hot. Names, cyphers, arms, and similar devices are all formed by grinding the glass with a very thin edged stone.

But plates of glass are ground in a peculiar way. Two are always ground together, one being imbedded in plaster of Paris upon a table, while the other, also imbedded in plaster, is suspended horizontally over the former, and made to move uniformly but pretty quickly over its surface. Sand of various degrees of fineness mixed with water is from time to time sprinkled between the plates, to accelerate the grinding process, and to enable the upper plate to press with sufficient force upon the lower, the plank to which the former is cemented is usually loaded with weights. Small plates may be ground with the hand, but large ones require the aid of machinery, and are generally moved by the steam-engine. Great attention is necessary in continually changing the relative position of the plates, to prevent the grinding from producing ridges, hollows, or other inequalities in the surface, and to insure the plates being of a uniform thickness. With this view, when the plates are partly ground, it is common to change the upper one for another in nearly the same stage. As the grinding proceeds towards a conclusion, the sand is exchanged for emery, also of various degrees of fineness.

Glass is generally cut by means of a small rhomboidal piece of diamond set in a proper handle, so that its cutting edge may act upon the glass. It seems extraordinary to an inexperienced observer, that there should be any difficulty in thus cutting a plate of glass, and yet few operations require greater nicety, or depend more on experience for their success. But this difficulty has been lately removed by the contrivance of a patent diamond, invented by Mr Shaw, an ingenious watchmaker of Leicestershire, by the use of which any person may produce a perfect cut on the surface of a plate of glass, though it should be uneven. It has been ridiculously supposed that the diamond does not really *cut* the glass in the part over which it passes, but acts in some mysterious manner, so as to produce a cut within or on the opposite surface. There can be no doubt that those who have formed this idea have been misled by an optical deception.

Glass may be cut in several other ways, though not so smoothly and uniformly as with the diamond. A plate of glass, even of considerable thickness, may be roughly cut into a circular form with a pair of scissars, if both the glass and scissars be held below the surface of water, or, what is better, of some more tenacious fluid. Glass is also cut or cracked pretty smoothly and regularly by means of a heated iron, first marking with a file the point at which the crack is to begin, and then holding the iron successively to the other parts of the intended line of division, removing it as the glass cracks, and advancing it forward so as to be about the tenth of an inch beyond the former crack.

6. *Polishing.*—As by grinding the surface of glass is roughened and rendered less capable of transmitting or reflecting the rays of light, it is to be restored to its former smoothness and lustre by *polishing.* This operation is very simple, and requires little apparatus. A wooden wheel having its edge covered with leather, on which is spread fine emery, tripoli, or putty, is set in rapid motion, and the rough surface of the article is held upon it till the requisite smoothness is produced. In polishing plates one of them is laid flat and steady on a table, and rubbed briskly over with a block of wood, having its lower surface covered with woollen cloth, and dipped occasionally in the polishing powders, changing from coarse to fine as the polishing proceeds towards a conclusion. When the pressure of the workman's hand is not sufficient to enable the po-

lisher to produce the due effect, it is pressed down by means of an elastic piece of wood from the ceiling, or by a spring.

Sect. II. *Of the Processes for making Bottle-glass.*

The dark green glass, of which common bottles, pickle jars, carboys for containing the mineral acids and similar articles, are formed, is the coarsest and cheapest kind, and requires the least nicety in the manufacture. As it pays the lowest duty, government have strictly enjoined that only the coarsest materials shall be employed in its composition. Coarse river or sea-sand and soap-maker's waste, in the proportion of one part by measure of the former to three of the latter, sometimes with the addition of a little kelp, are mixed together and placed in the calcining arches, where they are kept in a red heat for twenty or thirty hours, so as to form a sort of frit. In some bottle-houses the soap-waste is first calcined alone to purify it, and then heated with the sand. When the materials are sufficiently calcined, they are put while red hot into the melting-pots already placed in the furnace. These pots are open, and hold as much metal as can be worked up in what is termed a *journey*, that is, a day's work, though they labour night and day while the metal lasts. When the pots are filled the heat is increased, and kept up at an intense degree, till the metal is completely fused, which in this work requires from ten to eighteen hours. After this it is reduced to the working heat, and maintained at this degree by a due supply of fuel during the journey. The metal being scummed or cleared by boiling over, is now ready for blowing.

Six men and two or more boys are generally employed in the immediate manufacture of bottles, and each has a particular part assigned him, so that every thing is conducted with the utmost order and dispatch. One man gathers the metal and delivers it to another, who either merely blows it into a globular shape for carboys and similar articles, or blows it within a mould for common pint or quart bottles, or for square or octagonal half-pints, pints, and jars. Each piece as blown or moulded is handed over to the finisher, who forms the ring at the mouth of the neck, cuts it from the blow-pipe, and delivers it to a boy to be conveyed to the annealing oven.

Bottle-glass, though very coarse, and possessing little transparency, is preferable to any other for containing the mineral acids, as it has no lead in its composition; and from the high degree of heat which it supports without melting, it is better adapted to the making of retorts and other chemical apparatus that are to be subjected to great heat, particularly if employed in distilling nitric or muriatic acid. From the same glass are also made excellent crucibles, by keeping them for a long time in a pretty strong heat, which destroys the transparency of the glass, and converts it to a sort of porcelain.

Sect. III. *Of the Process for making broad Window or Table Glass.*

The common greenish window-glass, called broad or table glass, is superior in quality to bottle-glass, but inferior to that denominated crown-glass. It is made by melting together about four parts by measure of sand, five of soap-boilers waste, and three of kelp, after having calcined them for twenty or thirty hours. The above proportions are not always employed, as the quality and purity of the materials vary considerably, particularly those of the kelp and soap-waste. The finer the sand, too, the less pure alkali is required to melt it; and as the same quantity of alkali remains in the glass when made, it is clear that the use of coarse sand occasions a loss by the dissipation of part of the alkali during the fusing process. When the materials have been properly calcined, they are expeditiously removed with iron shovels to the melting furnace, and the pot being filled, the metal is exposed to a proper degree of heat for twelve or fifteen hours. By this time, it is fit for blowing into sheets. A sufficient quantity of metal is gathered on the blow-pipe to form a globular, or rather a conical ball, about twelve inches in diameter, and of the ordinary thickness of window-glass, and when the ball is expanded to the proper size, it is carried to the mouth of a furnace, and one side of it is touched with an iron dipped in cold water. By this operation is produced a crack running across nearly in a straight line. In consequence of this crack, the ball is disposed to open, and being placed on a smooth iron plate fixed at the mouth of the furnace, it is soon extended into a sheet nearly in the shape of a fan. After remaining a few minutes to harden without cooling too much, it is removed to the annealing oven.

Why these sheets of window-glass should be called broad, it is not easy to explain, as they can never be more than three feet in their longest diameter, a size much inferior to the finer kind of window-glass. The process just described is probably that according to which window-glass was originally made. It is convenient in point of economy to the manufacturer, but appears not to cut out so well as crown-glass, and is therefore not so well adapted to the purposes of the glazier.

A better method of forming table-glass, though a little more expensive, has been contrived by the German manufacturers. It consists in first blowing an oblong ball, in shape resembling a pear, the larger end of which is perforated and then expanded by means of a pair of spring tongs into a cylindrical form. Then an iron supported on a triangular fulcrum is attached to the cylindrical part, and the smaller extremity heated, perforated, and expanded in a similar manner till the whole forms a uniform cylinder of a proper length and diameter, which is cut open with a pair of shears, and extended on a heated metallic plate into a flat sheet of glass nearly square. This form has the advantage of being more equally cut into rectangular or lozenge-shaped panes.

Sect. IV. *Of the Process for making Flint-glass.*

Flint-glass or crystal, of which so many domestic articles are manufactured, is much more complex in its composition than either of the kinds yet described, though the working of it is attended with less labour, and occupies less time than the varieties to be presently noticed. It is composed chiefly of fine sea-sand brought from Lynn, Alum Bay, or

Processes.

Maidstone, red lead and pearl-ash in the proportions of three parts by weight of sand, two of red lead and one of ashes, with the addition of a small quantity of manganese and nitre, and sometimes a little arsenic. These materials, previously purified, are mixed together, but seldom calcined together into the state of *frit*. They are commonly kept ready mixed in binns in the mixing-house till wanted for melting, and are then thrown into the red hot melting-pots by a few shovelsful at a time, allowing each portion to melt before a fresh quantity be introduced, till the pots are full. It is common to melt with the fresh materials about one-fourth of their weight of old broken flint-glass. Two or three hours are commonly sufficient to melt each portion, but it requires twenty or thirty hours to form the whole into a clear transparent glass, free from particles of sand or bubbles of air, and to free it from the sandiver. The perfect state of the glass is usually ascertained by taking out a small quantity on the blow-pipe, and forming it into the shape of a long pear, with a small cavity within, and by inspecting this piece when cold, the purity, transparency, and freedom from colour of the glass, are readily judged of, and the workmen proceed accordingly to commence the operation of blowing, or suffer the metal to remain some time longer in the melting heat. It has been already remarked, that flint-glass is made in covered pots. The stoppers surrounded with moist clay are introduced after the last portion of materials is thrown in, and are only removed from time to time, after the usual interval has elapsed, to examine the state of the glass.

When the metal is found perfectly pure, the gatherers and blowers commence their operations, and continue working night and day till the batch is exhausted. The process of blowing is modified according to the form of the piece to be manufactured, as this is to be a wine-glass, a tumbler, a decanter, or a phial, and so of other pieces. It will be sufficient to illustrate it, by describing the method of forming a wine-glass, as practised in the British manufactories. When the blower has received from the gatherer the pipe charged with a sufficient quantity of metal, he seats himself in a chair provided with two elbows, one of which is protected from the heat by a plate of iron, and placing the blow-pipe across the elbows, so that the heated end may rest on the iron plate, having first formed the glass into a hollow ball, he rolls the pipe backwards and forwards, and laying hold of the farther side of the ball with a small pair of tongs, he draws it out to form the stalk of the glass, while the part next the blow-pipe is fashioned into the bowl. In the meantime, another blower having formed a smaller ball, opens it by a sharp cut, and presses it while red-hot against the end of the stalk held by the former workman, to which it immediately adheres, and is then separated by a smart blow from the blow-pipe, while the first blower separates his portion in the same manner, after the foot has been completely formed by the finisher. This last workman also brings the bowl into a proper shape, and makes the edge smooth and even, supporting the glass by an iron attached to the centre of the foot, heating and rolling it on the arms of the chair till reduced to the proper shape, when, like other articles, it is given to a boy to carry to the annealing oven by means of a long forked iron.

Processes.

Besides the kind of flint-glass just described as fitted for making domestic utensils, another variety is employed for optical glasses. This kind is generally composed of sixty parts, by weight, of pure white sand, previously calcined, reduced as fine as possible in an iron-mortar, boiled with sulphuric acid, and then washed with muriatic acid; one hundred parts of pure sifted red lead, fifty parts of purified nitre, and one part of very fine white chalk. This mixture is submitted to the heat of a bottle-glass furnace, in a crucible of platina, for about thirty-six hours, when the melted matter is poured into a vessel of water. When cold, it is dried and reduced to a very fine powder, and washed with the acids like the sand. These operations of melting, cooling in water, powdering and washing with acids, are twice repeated, and the mass is again melted for forty-eight hours, and allowed to cool gradually on a warm plate of copper.

SECT. V. *Of the Process for making Crown-Glass.*

The finest kind of window-glass, called crown, requires a great variety of apparatus and manipulations before it be reduced to the form of a flat plate, in which it is exposed for sale. Besides the melting furnace with its reverberatory arches for calcining the frit, the flashing furnace described in the first section of this chapter, and another called the bottoming hole, are here necessary. These latter furnaces contain no crucibles, but are employed for heating the metal from time to time in order to keep it sufficiently ductile to take the required form. The best crown-glass is generally composed only of fine Lynn or Maidstone sand and Orkney kelp, in the proportion of one measure of the former to two of the latter, but some manufacturers add slaked and sifted quicklime, and apportion the ingredients by weight. Thus, to make 800 pounds of crown glass, they use 450 pounds of kelp, 25 pounds of lime, and 325 pounds of sand. These materials being thoroughly mixed, are reduced to frit, as already described, some months before melting; and when they are to be made into glass, the cakes of frit are broken in pieces and thrown gradually into the crucibles, piling old glass over the whole as high as can be done without loss. Thirty or forty hours are usually required to reduce the metal to a state fit for forming crown-glass, which is ascertained by the usual method.

The operation is commenced, as in other works, by gathering and blowing a quantity of metal which the experience of the workman has shewn to be sufficient for forming a sheet or *table* of glass. When the metal, by frequent rolling on the polished iron table, is brought to a globular or cylindrical form, the blower inflates it gently into an oblong ball called a *parisienne*, and immediately heats it afresh at the mouth of the furnace, in order farther to expand it. It is then heated again at the bottoming hole and still further inflated, so as to assume the shape of a heart; and, by a third heating and pressure on the table, it is enlarged and flattened at the farther end. In this stage, a solid iron rod charged with melted glass is made to adhere to the centre of

Processes.

the expanded part opposite the extremity of the blow-pipe, and this latter is detached from the glass by a cold iron. A new stage is now commenced, for an orifice being left at the part where the blowpipe was attached, this opening is gradually enlarged by heating the glass at a small hole of the flashing furnace and afterwards at the larger opening of the same furnace, the workmen all the time whirling the rod which supports the glass on a hook in the cross wall which has been described as built to defend him from the heat. By degrees, in consequence of the heat and the centrifugal motion, the opening in the glass is continually enlarged, till, at length, it suddenly expands with great violence into the form of a large circular plate, four or five feet in diameter and of uniform thickness, except in the centre, where it is attached to the punt or supporting iron. From this iron it is separated in the usual manner by the application of cold, leaving in the centre a thick nodule called the bull's eye; and when the plate is sufficiently firm to prevent warping, it is carried to the annealing oven and placed on its edge in a proper frame to keep it flat, till all the tables are ready for final removal to the crates in which they are kept.

The whirling or flashing process, by which a hollow ball of glass is expanded into a flat sheet, is extremely curious, and well illustrates the tenacity and ductility of heated glass. It is estimated that the force with which the glass finally expands into a sheet would be sufficient, were the glass cold, to dash it into ten thousand pieces. The action of heat in enlarging the opening of the ball, after the blow-pipe is separated, is aided by an iron tool, with which an assistant gradually and uniformly presses against the edges of the opening so as to enlarge it as much as possible before the flashing operation. In making crown-glass it is of the greatest importance to preserve the uniform temperature of the melting furnace during the whole of the operation; for, if the heat be once checked, it is extremely difficult to raise it again to the proper degree, and much time is lost, while the glass made is of very different qualities. For want of due attention to this circumstance of regulating the heat, the crown-glass made in some manufactories is divided into four classes, called *firsts*, *seconds*, *thirds*, and *fourths*; between the two extremes of which there is a difference in price of at least one-half,—so that when the first sells at L.6, 10s. per side (each side containing 12 tables),—the thirds will bring L.4, 18s.,—and the fourths little more than three guineas. As the duty is paid by the maker, and falls equally on all these four classes, this difference occasions considerable loss, and might be avoided by taking care to keep up the heat.

Sect. VI. *Of the Processes for making Plate-Glass.*

Plate-glass is made in two ways, either by blowing or by casting; and each of these methods is now practised both in this country and on the continent. Of the two principal establishments for plate-glass in Britain, that at East Smithfield, in London, produces it by blowing, while the manufacturers of Lancashire employ the casting process. The former method is least expensive; but, in general, produces only small plates, which are much used for carriage-windows, and for glazing the windows and light-room in ships of war and some merchant vessels. The small thick circular glasses fixed in the decks of ships by way of skylights are, of course, formed by casting. Of late, it is said, the art of blowing plate-glass has been so much improved, especially in France, that plates measuring 60 inches in length by 21 in breadth, are now made by this method; but, by casting, mirrors seven feet in height by above four in breadth have occasionally been formed in France; and the establishment at Ravenhead has exhibited, at the warehouse near Blackfriars-bridge, London, plates of the wonderful dimensions of twelve feet by six.

Processes.

The materials for plate-glass are much the same with those employed in making other fine hard glass, but particular pains is taken in their selection and purification. The sand is of the finest quality from Lynn or Alum bay, and is previously well washed and dried. The alkaline salt is generally soda obtained by the decomposition of sea-salt by subcarbonate of potash, as mentioned in Chap. III. Quicklime, made from limestone brought from Gibraltar or from St Vincent's rock near Bristol, is usually preferred, and is slaked and sifted. A little nitre is used, and a considerable quantity of old plate-glass or *cullet*. The ordinary proportions of these ingredients for making 1700 lbs. of this glass are stated by Mr Parkes to be 720 lbs. of Lynn sand, 450 lbs. of soda, 80 lbs. of lime, 25 lbs. of nitre, and 425 lbs. of cullet. Another, but more expensive composition, is given in the Handmaid to the Arts, and consists of 60 parts of sand, 25 of pearl ashes, 25 of purified nitre, and 7 of borax, to which are occasionally added a little lime and manganese. Pearl ashes are now seldom employed, but some manufacturers use the subcarbonate of soda, as procured by lixiviation from the best Spanish barilla, as being more economical than obtaining it by decomposing sea salt. But as this salt is furnished to the glass-manufacturer free of duty, there is probably little difference in the expence; and as the manufacturer is allowed to export the refuse containing muriate of potash on paying a small impost, he can suffer little loss, and obtain a purer soda.

The expence of the apparatus, even for blowing plate-glass on a scale sufficiently extensive to make it profitable, is very considerable. It is estimated by Mr Johnson, translator of Beckman's History of Inventions, that a furnace for casting large glass plates before it can be set to work costs L.3500, and such a furnace seldom lasts above three years, and must be repaired every six months, while it takes three months to give it a thorough repair, and six months to rebuild it. The melting pots are as large as hogsheads, and if one of them burst in the furnace a loss in metal and in time of about L.250 is incurred. If to these expences be added that of the other complex apparatus to be presently described, amounting probably to L.500 more, it will be evident that a considerable capital is necessary for forming an establishment of this kind.

The most perfect furnace for manufacturing plate-glass appears to be what is employed in France, which merits a more particular description than could properly be given in the general account of apparatus. It consists of a central melting furnace with a double arched roof, capable of containing four melting pots and four cisterns, and having two or three openings on each side for introducing the materials, transferring the melted metal from the pots to the cisterns, and withdrawing the latter when filled with metal. At each angle of the principal furnace is another of an oblong form, communicating with the centre by flues, through which the flame reflecting from the arches of the melting furnace reverberates on their contents. Each of these corner arches has two openings, a smaller for producing a current of air and a larger for introducing and withdrawing what is placed in them. Three of them are usually employed for burning the melting pots and cisterns, which are made of the same fire clay, and the fourth for preparing the frit. Around the plate glass-house are several annealing furnaces like bakers ovens, with capacious mouths.

For receiving the melted metal from the pots, square cisterns of sufficient dimensions to hold metal enough for a single plate are used, and when these are filled they are withdrawn from the furnace by means of large iron tongs, supported on an axle with two wheels. Another pair of iron tongs made to encompass the cistern by entering a groove in its sides, and furnished at each end with a handle, for the purpose of more easily managing it, is attached by four chains to a sort of crane for suspending and raising the cistern into a proper position with respect to the table.

The casting-table consists of an oblong framework of wood, of a size proportioned to the intended plate, and covered on its upper surface with a thick smooth sheet of copper, having at its sides two iron rulers for keeping in the melted metal and regulating the thickness of the plate. An iron roller of considerable weight, furnished with a handle at each end, rests on the iron rulers at one end of the table, and is made to pass forward over the melted metal to condense it and form it into a plate of uniform thickness. The apparatus now described is used only in casting plate-glass, that for blowing being so simple as not to require a particular description.

In preparing for the manufacture of plate-glass, the materials are first reduced to powder, well mixed together, and calcined in the fritting arches. They are then removed as quickly as possible into the melting-pots previously heated; and after being fully melted, which generally requires about ten hours, the heat is continued at its utmost degree till the metal become perfectly fine, or *plain*, as it is here called. When this perfect state is ascertained, any farther admission of air is prevented by closing all the openings of the furnace; and every thing is suffered to remain stationary for nine or ten hours, when the plates are to be formed by blowing, which is the process at present to be described. This gradual cooling is found necessary to enable the melted glass to adhere sufficiently to the blow-pipe.

The mode of blowing plate-glass in a great measure resembles what has been already described for the manufacture of table-glass, except that a greater portion of metal is gathered on the blow-pipe, according to the size and thickness of the intended plate. The quantity is sometimes so large as would weigh nearly 100 lbs. When plates of the largest size are to be formed, the metal is gradually blown and worked into the form of a cylinder, which is cut open at one side with a pair of shears, and the soft glass is spread on a heated elevated floor, covered with a thick stratum of sand. After remaining in this situation for a few minutes, the plate is pushed endways into the annealing oven, taking great care to preserve its equality of surface. Small plates may be placed on their edge, like crown glass, in iron frames; but the larger plates should be kept perfectly flat on the floor of the oven. Plate-glass, whether blown or cast, requires a much longer time than any other to complete the annealing process; and it is usual to subject it to a moderate heat for twelve or fourteen days, while the openings of the oven are shut with clay to prevent the admission of air. After the proper interval has elapsed, the lutings are removed and the plates taken out and carried to an open part of the glass-house, that they may gradually acquire the temperature of the surrounding atmosphere. When they have remained in this situation for an hour or two, they are carried to another part of the establishment to be squared and ground.

In the general description of the process of grinding given in the first section of this chapter, sand is mentioned as being sprinkled between the plates to accelerate their grinding. Within these few years a very material improvement has been introduced into this process by Mr Heard, late chemical manager of the plate glass-works in East Smithfield. It had been observed that the refuse arising from the abrasion of the plates was nearly useless, in consequence of the iron contained in the sand, and therefore the glass worn off from the plates was lost, though, but for that contamination, it might have been remelted. This was a serious loss, as the original weight of the plates is *diminished* at least one-half by grinding. Mr Heard contrived to grind the plates by means of pure flint reduced as small as sand, and he found that in this way he not only produced a saving of time and labour, but formed a compound of powdered glass and flint, which was at least equal to the best cullet or broken glass for remelting.

The process of casting plate-glass has generally been kept secret, though now pretty well understood. The previous operation of founding the metal scarcely differs from what has been already described, except that, when the glass is completely fined, it is ladled from the pots into the cisterns, which thus charged are drawn out on projecting ledges and conveyed to the casting table, over which they are suspended by the contrivance mentioned in the beginning of this section. Although the cistern full of metal be of very considerable weight, it is turned without much difficulty on the centre of two levers to which the chains that support the tongs are appended, and by the handles of these tongs is made to empty its contents upon the table. The moment the fluid metal is thus transferred to the table, the heavy iron roller, weighing about 500 lbs. is made to pass steadily and rapidly over its surface, sweeping off the superfluous matter into troughs placed at the sides of the table, and when the roller reaches the farther extremity, it is expeditiously lowered on a tressel, which prevents its interfering with the plate. The operation of casting is conducted close to the mouth of the annealing oven, so that the plate, when sufficiently solid, is pushed off horizontally with a grooved iron ruler set across a long wooden handle, and is thus safely deposited on the smooth floor of the oven. These ovens are called *carquaises*, and made so capacious as generally to hold six plates each lying beside each other.

The price of plate-glass is regulated by the number of square feet in each plate, increasing progressively, though not proportionally with the extent of surface. Thus, when a plate of six square feet is sold for L.4, before silvering, a plate of double the size brings L.14, 5s.; one of 48 square feet, L.225, 10s.; and one of 60 square feet L.395.

Chap. V. Of Enamelling.

Enamel is a sort of glass generally opaque, and much more fusible than common glass. The opacity is produced chiefly by the oxide of tin, and its great fusibility depends on the quantity of oxide of lead which enters into its composition. This substance is always coloured, and receives various tints from different metallic oxides; but sometimes it is transparent. It is employed chiefly for covering thin sheets of copper or gold, in the manufacture of dial-plates for watches, ornamental watch-cases, plates for a peculiar species of painting, and several articles of jewellery; and a peculiar kind of it is used as a glazing for Dutch or Delft earthen ware, and that kind of porcelain denominated soft or tender.

In this chapter two processes are to be considered—the method of making and colouring enamel, and the application of it to metallic plates.

Sect. I. *Of the Processes for Making and Colouring Enamel.*

The materials of which enamel is fundamentally composed are similar to those used in the composition of glass, consisting of fine white sand, in which is a mixture of talc, fused by means of certain alkaline or saline matters. The alkali is generally soda in combination with muriatic or boracic acid, in the forms of sea-salt and borax; but sometimes carbonate of lime, and sometimes a small quantity of nitre, is added. Red lead, or some other oxide of that metal, is an essential ingredient; and for opaque enamel the oxide of tin, technically called *putty*, is necessary. This oxide is usually prepared, by calcining together a mixture of lead and tin in various proportions, generally 100 parts of lead to 20 or 25 of tin. The tin must be extremely pure, and the calcination must be continued till the mixture ceases to sparkle, and appears of a uniform colour.

The colouring materials are chiefly the metallic oxides mentioned in Chap. II., and they are prepared much in the same manner as there described.

Oxide of gold produces a purple or carmine red, or a violet; the oxides of iron give a red, which, however, is fugitive in a considerable heat; yellow is produced by regulus of antimony, or by this metal combined with an oxide of lead, and a finer, but more fugitive yellow, is derived from the oxide of silver. Oxide of copper, in its lowest state of oxidation, furnishes a red, but this metal is generally employed to produce a green. Blue is obtained from the oxide of cobalt, and is the most fixed of all the enamel colours, and the more beautiful the more the metal is oxidated. The oxide of manganese gives various shades, from a violet to a black, according to its degree of oxidation, and the fluxes with which it is melted; but the finest and most brilliant black is obtained from a mixture of the oxides of manganese, cobalt, and iron.

To form *white enamel*, a hundred parts of the compound oxide of lead and tin, called by the manufacturers *calcine*, is mixed with an equal weight of sand, and from twenty-five to thirty parts of sea-salt are added. If the enamel be intended as a glaze for earthen ware, the sand is employed in its crude state; but for being applied on metal, it is previously calcined in a strong heat, with one-fourth of its weight of sea-salt. The more fusible the enamel is to be, the less proportion of sand is used; and for a very fusible enamel the proportion of lead is increased. The mixture of these ingredients is fused in a potter's furnace, and after being taken out is powdered, and the powder employed instead of sand, to be afterwards fused with proper fluxes. Thus sixty parts of the powder, thirty of alum, thirty-five of sea-salt, and a hundred of oxide of lead, produce a white enamel for pottery that is to undergo a strong heat.

Another white enamel, which may serve as a flux for blue and purple, is composed of three parts of powdered flint-glass, one of calcined borax, one of the white oxide of antimony prepared with nitre, and about a quarter of a part of nitre; and another proper to be used as a flux for these and other delicate colours, is formed of three parts of sand, three of calcined borax, and one of chalk.

Good white enamel, fit for being applied either on baked earthen ware or on metallic plates, must easily acquire lustre by a moderate red heat, without entering into complete fusion, and must not contain such a portion of deliquescing salts as to render it liable to be injured by water. It is also necessary, that the lead and tin employed be very pure, in particular that they contain no admixture of copper or antimony. White enamel is of two kinds, hard and soft. Till very lately the first was always imported from Venice; but within these few years hard enamel, superior in whiteness to the best Venetian, has been made in London.

Purple enamel is made by adding to either of the two white fluxes above described a sufficient quantity of purple oxide of gold. The proportions vary according to the intensity of colour to be produced. For a light purple, one part of the oxide is sufficient for twenty parts of flux; but for a very deep colour the oxide must constitute about one-fifth.

Red enamel.—To prepare a flux for this colour, two parts, or two and a half of alum, and of sulphate of iron in crystals, are fused together and completely mixed; and when the water of crystallization is dissipated, the mass is kept in a red heat in a reverberatory furnace, till it acquire a uniform and beautiful red colour on cooling. If the red is to be pale, the proportion of alum must be increased. Thus three parts of alum to one of sulphate of iron give a flesh colour, while equal parts give a pretty deep red. This is mixed with a flux composed of enamel sand, red lead, sea-salt, and alum, in proper proportions, and in general one part of colour is sufficient for three parts of flux.

Yellow enamel.—The colouring matter of yellow enamel is formed by various methods, according as the enamel is transparent or opaque. In the former case, sulphate of silver, ground to a proper consistence, and applied on one side of a plate of transparent enamel, is submitted to heat till the silver be reduced to the metallic state, and this coating being removed, a beautiful yellow stain is left below. For opaque enamel, one part of white oxide of antimony, the same quantity of alum and of muriate of ammonia, (sal ammoniac,) with from one to three parts of white oxide of lead, all reduced to powder and well mixed together, are heated till the muriate of ammonia be partly sublimed and partly decomposed, and the matter in the crucible assume a yellow colour. But little flux is necessary for yellow enamel, and in general one or two parts of flux to one of colour is sufficient. The best flux for this purpose is composed of enamel sand, oxide of lead, and borax. Any other neutral salt, especially sea-salt and nitre, must be avoided.

Green enamel is obtained directly, by combining one part of any oxide of copper with one or two of enamel flux. This colour agrees with all the fluxes, whether saline or metallic, and by using one or other of these the shades of green may be varied. Green enamel may also be produced by employing a mixture of yellow and blue; especially in transparent enamel, in which it is usual to stain the one side blue with cobalt, and the other yellow with silver.

Blue enamel.—The best flux for blue enamel is composed of glass which contains no metallic oxide, borax, nitre, and well washed white oxide of antimony, using not more than one-sixth of the last. This flux is fused with oxide of cobalt, in such proportions as may produce the desired shade of blue.

Violet enamel is easily obtained by combining a moderate quantity of black oxide of manganese with any of the saline fluxes, regulating the flux and the heat according to the desired shade.

SECT. II. *Of the Processes for applying Enamel to Metallic Plates.*

The enamelling art, by which plates of metal are coated with enamel, has long been brought to considerable perfection, especially in the construction of the dial-plates of watches and of ladies trinket boxes. It will be sufficient here to illustrate this art, by briefly explaining the method of making dial-plates.

The dial-plate manufacturer requires a number of tools and pieces of apparatus, as dies, or small circular brass plates, about 1-10th of an inch thick, and varying in diameter from 3-4ths of an inch to 2½ inches, according to the size of the intended dial-plate, perforated in the centre with a hole; a steel-punch about an inch and a half long, and 3-10ths of an inch thick, rounded at the end; a round broach, such as is used by clockmakers, fixed in a strong handle; a concave block, made of box or some other hard wood, of a diameter rather larger than the largest brass die, and perforated in the centre with a hole larger than what is to be made in the centre of the dial-plate; a pair of horse-scissars for cutting the metal-plate; a spatula, formed of steel-wire, of the same diameter with the punch, with its end flattened and rounded, and bent into a circular arch; a smooth file, such as is used by needlemakers; a small steel point, rather stouter than a stocking-needle; a pair of corn-tongs or tweezers; a large soldering-lamp, capable of holding a quart of oil, with a cylindrical spout for the cotton, rather more than an inch in diameter; a blow-pipe of convenient length, with the orifice rather more open than usual; a pair of cutting nippers; a gauge properly graduated, such as is used by watchmakers for measuring their glasses and dial-plates; a pestle and mortar of agate, and another of iron, with a steel bottom, for grinding the enamel; a small hammer, with a riveting edge; several steel-spatulas, some like painter's knives, others shaped like half-round files; a quill cut like a toothpick; two or more clean damask napkins; a cylindrical block of wood, about six inches by 1½ inches diameter; a small steel-anvil, that can be held in the hand, for breaking the enamel into pieces fit for grinding; and a box about 16 inches long, 9 broad, and 1¼ deep, open in front, but furnished with a lid, for holding the plates during part of the process.

The first part of the process is to prepare the copper plates. For this purpose, a sheet of very thin copper is cut with the scissars into square pieces, which are formed into the proper shape by pressing them on dies corresponding to the size of the watch frame, as measured by the gauge, always using a die half a size larger than the frame. By means of the punch a hole is made in the centre of the copper corresponding with the central hole in the die, into which, after being filed pretty smooth, it is made to fit exactly with the broach. After this, the plate is cut neatly round, and burnished about the edge with the broach. It is then taken off the die and made smooth on the edge and central hole, and it is then ready for attaching to it the feet by which it is to be fixed to the watch frame. To mark the places for the feet, the copper plate is adjusted to the watch frame, and dots are made by passing the steel points through the holes in the frame, and about these dots are described with the same instrument, small squares which prevent the feet from slipping. The feet are made of copper wire plated with silver, are cut to the proper length with a file, and the ends, where they are to join the dial-plate, are filed to a proper angle corresponding with the concavity of the copper. They are cut with the nippers to the proper length, and being dipped into a thick solution of borax, are set in their proper places in the copper with the tweezers. They are now ready for soldering, which is thus performed. A large piece of close charcoal, with a hollow for receiving the convexity of the copper plate, is held in the left hand below the flame of the lamp, so that a stream directed through its centre with the blowpipe may fall directly on the part to be soldered, till the copper is red hot, when, withdrawing the pipe from the centre, the whole flame is directed on the copper till it be nearly of a white heat; then, by another slight blast through the centre of the flame round each of the feet, the soldering will be completed, and the plate is to be adjusted to the frame and made to fit properly. Any inequalities that have arisen during the soldering are smoothed down with the steel spatula first mentioned, by replacing the copper in the die and rubbing the bended part of the spatula round the junctures of the feet. If the dial-plate be intended for a common watch without a seconds hand, the copper is now complete except being *pickled.* but if the watch is to have a seconds hand, the hole corresponding to it is made in the copper when fitted to the frame, and filed smooth like the central hole. The operation called pickling consists in immersing the plates after soldering in a weak solution of nitrous acid, and then cleaning them with a soft brush and fine white sand till they are perfectly bright. In this way, the oxide formed during the soldering is removed and the plates are ready for enamelling.

To render the enamel fit for applying to the surface of the plate, it is first broken into pieces about the size of a small pea, and then carefully ground in the agate or steel mortar, according to the kind, till it be sufficiently fine. The kind called soft glass enamel, or simply glass, must not be beaten, but ground with water in the agate mortar to the state of fine sand, washing away from time to time the finer powder which is produced. The hard or Venetian enamel is first beaten in the steel mortar, and then ground in the agate mortar till it be sufficiently fine. It must be finer for the bottoms than the tops of dial-plates, and therefore, in grinding for the former, the impalpable powder is not washed away, and what is thus removed by grinding with water is allowed to subside and is kept for bottoming. Before grinding, the hard white enamel intended for the tops of dial-plates is heated red hot in a muffle, and thrown into very clear cold water, by which it is split into pieces sufficiently small for grinding in the agate mortar.

When the upper surface of a dial-plate is to be coated with soft glass-enamel, the process is generally thus conducted: One of the napkins doubled fourfold is laid on the work-board, and the concave surface of the copper is roughly spread with fine hard enamel, (taken from a gallypot in which the powdered enamel is always kept below water,) drawing it close up round the feet and holes. It is then laid between the folds of the napkin to absorb some of the water, and the enamel is gradually spread smooth and even by the alternate use of the spatula and napkin. Then the holes are cleared of enamel with the quill, and a moderately thick coating of bees-wax being put on the upper extremity of the cylindrical piece of wood, the dial-plate is placed on it with the bottom downwards, and the feet are gently pressed into the wax by means of the die, to avoid greasing the upper surface, till the concave part nearly touch the wax. Removing the die, the upper surface is cleaned with a soft brush or hare's-foot, and a little of the soft enamel is spread on it, taking the greatest care that no water or enamel pass through the holes, as the former would loosen the enamel from the concavity, and any mixture of the two enamels would spoil both. Considerable nicety is required in spreading the enamel over the upper surface that it may be gradually brought to a sufficient degree of smoothness. This object is effected as before by the alternate use of the napkin and spatula; but here it is of consequence that the water should not be too much or too suddenly abstracted. When the surface is properly covered, the plate is carefully taken from the block and lifted between the finger and thumb to the box, while other plates are coated in the same manner.

When the copper is to be coated with hard enamel on its upper surface, it is placed on the wax of the laying-block, as in the former process, and a coat of glass-enamel, about two-thirds of the thickness directed for soft enamelling, is spread over it, and reduced to a smooth surface by means of heat. It is then immersed in weak nitrous acid to remove the oxide formed about the edge by the heat, and, being replaced on the laying-block, a small quantity of hard enamel, well washed, is spread over the former, and brought to a smooth surface in the usual way.

The last part of the process of enamelling is called firing, by which the plates are subjected to heat to make the enamel adhere. For this process are required a ring, for supporting the edge of the plate and preventing the feet from being deranged by the necessary motion; a flat circular piece of fine stone, or baked Stourbridge clay, about one-eighth of an inch thick, called a *planch,* for supporting the ring; a small piece of clay, moulded into a spherical form, called a turner; and a muffle. The ring is made of a mixture of two parts of blacklead melting-pot, ground to a very fine powder, and one part of pipemaker's clay tempered into a ductile mass with water; and the muffle is made of fire-clay. A furnace, such as is used for earthen-ware, is sufficiently heated, and the enamelled plates, placed each on a ring, are set at the mouth of the furnace to drive off all the remaining moisture. In the meantime the planches having been placed in the furnace till they acquire a white heat are withdrawn, and a plate and ring set on each as nearly as possible in the centre. The planch thus loaded is balanced on a turner, and placed within or below a muffle already in the furnace. Here the planch is kept in perpetual motion till the plate shews an uniform brilliant surface. It is then removed from the fire, and another heated in the same manner till the whole are fired.

The firing of the plates demands great attention, and is subject to several accidents, such as blistering or specking the enamel, or producing cracks, which if not speedily repaired render the plate useless. The specks or blisters are removed with a square graver, and any hollows or cracks are filled up with fresh enamel laid very smooth, and the plate is again subjected to heat. After this first or second firing the dial-plate is still incomplete, and its surface is rubbed over a fine grit stone to take off the polish, and ren-

Staining.

der it more uniform. This is called *using off*, and after it the enamel is brushed with fine wet sand, washed in water, dried with a clean napkin, and again subjected to heat.

Chap. VI. Of Coloured Glass and Artificial Gems.

The more interesting, though not the most useful part of the glass manufacture, is that which explains the method of colouring transparent glass, and of imitating the precious gems. Glass may be coloured *partially* when the colour scarcely extends beyond the surface, or entirely when the whole mass is impregnated with the colouring matter. This division naturally gives occasion to sub-divide the present chapter into the following sections.

Sect. I. *Of the Processes for Staining Glass.*

The art of colouring glass superficially cannot, as has been noticed in the historical part of this treatise, be carried beyond the Christian era, and appears to have been in its greatest perfection during the 15th century. This art has been improperly called *painting* on glass; for though the stain imparted by the colouring matter scarcely penetrates within the body of the glass, it is so indelible that it cannot be removed by washing the surface with any known substance, though any ordinary application of transparent colours to the glass without heating may in that way be easily effaced.

Glass intended to be stained must be of that kind which contains in its composition no metallic oxide, as such an ingredient would tend to destroy the colouring matter or diminish its intensity. In particular, it must not contain the oxides of lead or manganese, nor must borax enter into its composition, as this salt would occasion the colours to spread too much. For these reasons, crown or fine window glass is employed. To prepare the glass for receiving the colouring matters it is coated with a solution of gum-arabic; and if the design to be expressed in colours be too large for a single piece of glass as when it is to form a compartment of a window, the pieces that are to make up the whole painting are properly arranged and fitted to each other on a bed of glaziers putty, or other adhesive cement, allowing space for the lead or other substance by which they are to be connected. The design which is to be expressed in colours on the glass is first drawn, and generally painted in its proper colours, on paper, and the paper is placed below the plate or connected plates of glass, that it may be the more readily traced upon the latter. The upper surface of the glass being covered with a thin coating of clear gum-water by means of a brush or spunge, the outlines of the painting are traced on it with a fine pencil with some dark colour that will be readily dissipated by a strong heat, and the prominent shades are laid down in the same manner. In this stage of the process the outline on the glass resembles an ordinary engraving on copper, and is to be filled up with the proper colouring substances to be presently mentioned.

Staining.

The application of these colouring matters to glass is extremely different from ordinary painting on other substances. Here the artist works apparently in the dark, and judges only from experience of the effect which his labour is to produce. Many of the substances which he applies are either colourless, or exhibit when applied very different tints from what they produce after the glass has been subjected to heat. It must also be remarked, that the colours in this art are such as are to appear by transmitted, not by reflected light. And what they will be is previously ascertained by experiments on detached slips of glass, which are kept as samples.

The colouring matters employed for staining glass, like all that have been mentioned in this treatise, are derived from metallic oxides ground into a fluid of proper consistence with brandy, vinegar, or a solution of isinglass in either of these liquids. As some metallic oxides produce very different colours when applied to the substance of enamel and the surface of glass, it will be proper here to particularise those oxides which are most applicable to the latter purpose.

The purple oxide of gold cannot be employed successfully for staining glass of a red or purple colour, but it produces a very fine violet, liable, however, to change to blue. The red oxide of iron prepared with nitric acid, and heated with a flux composed of borax, sand, and a small quantity of red lead, produces a very good red or rose colour; and if the oxide be very much calcined it produces a good brown. The oxide of cobalt produces the best blue, and it is fluxed with sand, potash, and lead. Oxide of copper does not succeed on glass in producing a good green, as it will not bear a great heat, but it produces a pretty good red. The brown oxide of copper mixed with manganese, and the oxide of iron called *umber*, produces that shade of brown denominated bistre and a good brown-red. Oxide of antimony produces only a dirty yellow when applied in this way; but a mixture of muriate of silver, oxide of zinc, yellow oxide of iron, and white clay, ground together without being fluxed, gives to the surface of glass a very fine yellow. The same colour is obtained from a mixture of oxide of silver, precipitated from its solution in nitrous acid, and mixed with well burned and pounded pipe-clay. The best greens are produced by applying the cobalt blue to one surface of the glass, and the yellow obtained from silver on the other. It is necessary to observe that the yellows must be applied to the under surface of the glass, as they are apt to run and mingle with the other colours. This circumstance of one colour running into another may occasionally be taken advantage of when it is desirable to produce a compound tint. But this experiment succeeds only in the hands of a skilful and experienced artist.

After the colours have been laid on, the stainer goes over his work with a quill cut into the form of a pen without a slit, with which he scratches off some of the colour when the strongest lights are to be produced, as in the light parts of drapery, the hair, eyes, and surfaces from which the light is to appear reflected.

Artificial Gems.

The pieces of glass are now ready for fixing the colours by burning. For this purpose they are placed in a muffle made of fire-clay and closed with folding doors of iron, having small openings for introducing and withdrawing slips of glass, which are to serve as tests of the success and progress of the operation. The glasses are laid on a bed of powdered quick-lime recently burned, and, if necessary, successive layers of lime and glass may be introduced till the muffle be nearly full. The muffle is then placed in an enameller's or small potter's furnace, a fire kindled round it, and the heat is gradually increased to such a degree as will soften but not melt the glass. By the action of such a heat the colouring matters are fixed on the glass, without destroying its transparency. When, by examination of the tests, it is found that this object is attained, the fire is slackened, and allowed to die away by degrees, so as to anneal the glass.

SECT. II. *Of the Processes for imitating Gems.*

The fine kind of glass called *paste*, with which the precious gems are so successfully imitated, differs from ordinary glass in possessing more lustre, in being more fusible, and in being formed of finer materials, and in a more complex manner, with every attention to nicety of manipulation. When thus formed, it can with difficulty be distinguished from the precious stones. A mere inspection is insufficient; but when examined with a file it is found softer than the natural gems which it resembles, and when weighed proves to have a less specific gravity. Their excellence as successful imitations, consists in their uniformity of texture and colour, and their high degree of lustre.

The first object in the imitation of precious stones, is to form a colourless paste, which may serve as a base for the several kinds, and which, when melted with the proper colouring substances, or left in its natural colourless state, may be formed into a shape and size resembling those of the gem to be imitated. The fundamental ingredient of such a paste is some one of the purer siliceous substances, as the purest flint, quartz, pebbles, or rock-crystal. They are heated red hot in a crucible after being reduced to powder, and are then put into a vessel of wood or Wedgewood's unglazed earthen ware, containing pure cold water, and being frequently stirred, so that the lighter particles of earth or other contaminating matters may rise to the surface or be diffused through the water, the water is poured off, and the matter which remains at the bottom is dried, powdered, and passed through a very fine silk sieve. This powder is now digested with the purest muriatic acid in a common glass bottle, for four or five hours, frequently shaking the mixture; and after being allowed to settle for some time, the acid is poured off, and the earthy powder washed repeatedly with distilled water, dried, and kept for use.

By fusing this siliceous powder with various fluxes, particularly borax, nitre, sub-carbonate of potash, and some oxide of lead, six different bases for artificial gems may be produced. The most beautiful of them is what M. Fontanieu, whose processes are here followed, calls the Mayence base, and is thus prepared: Eight ounces of siliceous powder, mixed with 24 ounces of pure sub-carbonate of potash, (salt of tartar,) are calcined to produce a frit; and after being left to cool, the frit is put into a Hessian crucible, with a sufficient quantity of hot water, to be dissolved. The solution is transferred to a vessel of Wedgewood's unglazed ware, and nitrous acid is added as long as such addition produces any effervescence. The saline liquor is then decanted off, and the precipitate is washed with warm water till the water come off tasteless, when the powder is dried, mixed with twelve ounces of fine white lead, and the mixture is well ground with a sufficient quantity of distilled water. The compound powder is again dried, and well mixed in a marble mortar with calcined borax, in the proportion of one-twelfth of the compound powder. The new mixture is melted in a Hessian crucible, and while fluid is poured into cold water, taking care to remove any lead that may have been reduced to the metallic state. The fusion and washing are twice repeated, and the matter thus purified is dried, powdered, mixed with five drachms of nitre, and once more melted in a fresh crucible. The mass resulting from these complex manipulations, is a pure transparent crystal of extraordinary lustre, and may be successfully employed to imitate the diamond. This constitutes M. Fontanieu's fifth base, but will here be always called the Mayence base.

Artificial Gems.

Fontanieu's first base is formed by mixing together twelve ounces of siliceous powder, twenty ounces of scaly oxide of lead, four ounces of nitre, the same quantity of borax, and two ounces of white arsenic, all in powder, and melting them three successive times in a fresh Hessian crucible, pouring the melted matter after each fusion into cold water, and finally washing and drying it.

To form the second base, eight ounces of siliceous powder, twenty ounces of white lead, four ounces of sub-carbonate of potash, and two ounces of calcined borax, well mixed together, are melted, washed, and dried as before.

The third base is composed of eight ounces of siliceous powder, sixteen ounces of red lead, four ounces of nitre, and the same weight of the sub-carbonate of potash treated in the manner above described.

For the fourth base, eight ounces of siliceous powder, twenty-four ounces of calcined borax, and eight ounces of sub-carbonate of potash are mixed together, melted and thrown into warm water, and to the dried mass is added an equal weight of red lead, when the mixture is melted and purified by repeated washings.

The sixth base, according to Fontanieu, is prepared from three ounces of siliceous powder, eight ounces of white lead, two ounces of borax reduced to fine powder, and half a grain of manganese.

Having thus obtained a sufficient number of bases, the artist is prepared for forming artificial gems, by fusing one or other of them with the appropriate colouring matter.

The *artificial diamond* requiring no colour, is imitated by the Mayence base, cut and ground into the proper form, and exquisitely polished; but what is called the yellow diamond, is formed by adding twenty-four grains of horn silver, or ten grains of glass of antimony, to one ounce of Fontanieu's fourth base.

The *oriental ruby* is best imitated by combining sixteen ounces of the Mayence base, with about three drachms of the purple oxide of gold, the same weight of red oxide of iron, prepared with nitric acid, as much golden sulphuret of antimony and fusible manganese, and two ounces of powdered rock crystal. The fusible manganese is prepared by roasting and powdering a pound of the best black oxide of manganese, mixing it with an equal weight of nitre, and calcining the mixture for twenty-four hours, then washing the calcined matter with warm water till it cease to show any taste; drying the remaining matter, and mixing it with an equal weight of muriate of ammonia; levigating this mixture on a porphyry slab with diluted sulphuric acid; after which the mixture is dried, and the muriate of ammonia sublimed off, when a quantity of the same salt, equal to what was sublimed, is added, and again sublimed; and this operation is repeated six several times, levigating the mixture each time with diluted sulphuric acid, and drying it before sublimation. The ruby called *balass* is imitated by fusing together sixteen ounces of the Mayence base with three drachms of fusible manganese, and about two drachms of purple oxide of gold.

The artificial *sapphire* is formed by combining twenty-four ounces of Mayence base with two drachms and 46 grains of the oxide of cobalt.

The oriental *topaz* is imitated, by colouring twenty-four ounces of the first or third base, with five drachms of glass of antimony.

The *Brazil topaz*, by adding one ounce and 24 grains of antimony, and eight grains of the purple oxide of gold, to 24 ounces of the second or third base; and the Saxon topaz, by combining six drachms of glass of antimony with 24 ounces of the first or third base.

The artificial *emerald* is produced by adding to 15 ounces of either of the bases one drachm of mountain blue and six grains of glass of antimony, or to one ounce of the second base 20 grains of glass of antimony to three grains of oxide of cobalt.

To imitate the *amethyst*, 24 ounces of the Mayence base are combined with four drachms of manganese previously exposed to a red heat, quenched in vinegar, dried, and reduced to a very fine powder, and four grains of purple oxide of gold.

The artificial *beryl* is made from 96 grains of glass of antimony and four grains of oxide of cobalt, combined with 24 ounces of the third base.

The common *opal* is imitated by adding to one ounce of the third base two grains of horn silver, two grains of calcined magnet, and 26 grains of some absorbent earth.

It is difficult to give rules for conducting the fusion of these coloured pastes, so as to regulate the heat that it may be sufficient to insure the complete combination of the materials, without being carried so far as to injure the colours by decomposition. Much must depend on the judgment and experience of the artist; and so necessary are these qualities, that though it cannot be doubted that Homberg, Neri, and Kunckel understood and successfully practised the art, no chemist has fully succeeded by following their minute directions without the assistance of his own experiments. Even after the pastes have been prepared in the most careful and scientific manner, they are indebted for the full display of their brilliancy and lustre to the lapidary who cuts and polishes them and the jeweller who sets them. Indeed the same observations apply, in some measure, to the precious gems themselves.

SECT. III. *Of the Process for making Artificial Pearls.*

Intimately connected with the glass manufacture is the art of imitating pearls, invented in France about the middle of the seventeenth century, and since carried on in that country to a great extent. The history of this invention, as given by Professor Beckmann, is highly interesting.

About the beginning of the sixteenth century the Venetian glass-makers at Murano had contrived a method of imitating pearls by encrusting the inside of hollow glass beads with a pearl coloured varnish, produced, it is supposed, from some preparation of mercury; but the Venetian government, from an idea either that this was practising an iniquitous fraud, or that the mercurial composition was injurious to the health of the wearers, suppressed the manufacture. Sometime after this another attempt was made to imitate pearls by covering small balls of wax or gum with a pearl coloured enamel, though how this could be effected it is not easy to conceive. It is more probable that the thin enamel beads were first formed and then filled with the wax or gum. These beads were much praised on account of their lustre; but as it was soon found that their beauty was destroyed by moisture, they fell into disrepute. At length, about the middle of the seventeenth century, M. Jacquin, a French bead-maker, who possessed a country house near Passey, observed that when the small fish called in France *ables*, or abletes, (the *Cyprinus alburnus*, or bleak) were washed, the water was filled with fine silvery particles. On suffering this water to stand for some time, he obtained from it a sediment which had the lustre of the most beautiful pearls, and was hence led to the attempt of employing it for making artificial pearls. He scraped off the scales of the fish, and thus procured a soft shining powder diffused in water, which he denominated essence of pearl. In his first attempt he made small beads of plaster of Paris or hardened paste, and coated them with this shining powder. But the ladies who purchased these artificial pearls, observed that when they were exposed to heat, their pearly coat came off on the skin, and gave it an unnatural brightness. Some of them ingeniously suggested to Jacquin, that if hollow glass beads were coated on the inside with his essence, a more complete and convenient imitation of pearls would be produced. The artist adopted the hint and soon carried this beautiful manufacture to a high degree of perfection. So complete was the imitation, that a string of Jacquin's pearls, which cost only three louis, has passed for one of real pearl, valued at 20,000 livres, (nearly L.850.)

The process for making artificial pearls, as described

Artificial Pearls.

by Beckmann, is as follows:—Slender tubes called *girasols*, are first formed of a kind of glass that is very fusible, and is sometimes coloured a little blueish. From these tubes the artist, by means of a lamp, blows as many small hollow balls as he may require, and in the course of a day a single workman can blow from 1200 to 6000, according to the quality or beauty of the intended pearls. They are made of various figures, some globular, some like a pear, others like an olive. To make them more natural, small dints or other apparent blemishes are occasionally left in them.

To prepare the essence for coating the inside of these beads, it is mixed with a solution of isinglass, which being melted at the time of using, enables the artist to blow a certain quantity into each globule with a fine glass-pipe, and it is afterwards diffused equally throughout the beads by shaking them in a vessel placed over the table till the liquid becomes cool and dry. To give them more solidity, they are then filled with melted white wax and bored with a needle; and, to prevent the thread on which they are strung from adhering to the wax, the canal made by the needle is neatly lined with fine but tough paper. Very great numbers of fish are required to produce a sufficient quantity of the pearl essence, it being computed that from 18,000 or 20,000 only a pound of essence can be obtained, so that this quantity costs in France from 15 to 25 livres. For a long time it was found extremely difficult to preserve the essence from putrefaction till wanted; for it was found that the ordinary means of employing brandy or other spirits for that purpose failed of success, as the beauty of the essence was destroyed by the acid that is often contained in diluted spirits. At length it was discovered that the essence might be effectually preserved in its original beauty in a solution of ammonia or volatile alkali. So great has been the demand for artificial pearls in France, that in one manufactory, in the province of Burgundy, 10,000 of them have been made daily.

CHAP. VII. OBSERVATIONS ON THE PRINCIPLES OF GLASS-MAKING.

The theory of glass-making is still imperfect. Several of the manipulations have been explained in the course of this treatise, and reasons have been assigned for the employment of certain ingredients in preference to others.

From the known properties of siliceous earth, its extremely difficult fusibility in the strongest heat which art can excite, and its affinities with the fixed alkalis and certain alkaline earths, it is easy to understand how glass is produced from the combination of *silex* with potash, soda, and lime. The *bottle*-glass is tinged of a dark-green in consequence of the iron contained in the coarse sand of which it is formed. The *flint*-glass owes its lustre and superior density to the lead which enters so largely into its composition. Lead is a metal easily vitrified, and therefore readily combines with the ingredients of glass; and as, from its being an inflammable body, or one that is easily united with oxygen by means of heat, its glass exerts a considerable refractive power on the rays of light, the addition of lead in flint-glass renders it more refractive, and consequently more brilliant.

Principles.

But the most difficult part of the theory of glass, and that which it is intended particularly to consider in the present chapter, is the effect of the *annealing* process in rendering glass less fragile. Before attempting to explain this effect, however, it is necessary to describe the properties of *unannealed* glass. These properties are best illustrated by unannealed cups, and what are called *glass-tears*, or *Prince Rupert's* drops.

A cup or glass that has not undergone the process of annealing, but has been suffered to cool by exposure to the air after it is blown, has this remarkable property:—it will often remain entire after having received the shock of a musket bullet dropped into it from the height of several feet; though if a very small angular piece of flint or glass be let fall into it in the same manner, it will be shivered into a thousand pieces. The same phenomena will take place not only with thin glass, but when the bottom of the cup or glass is at least three inches thick.

The glass tears called *Rupert's drops*, because first introduced to the notice of the English philosophers about the middle of the seventeenth century by prince Rupert, son of the Elector-palatine, and grandson of king James the First, are formed by dropping a moderate quantity of melted glass, generally of bottle-glass, into cold water, when it usually forms an oblong pear-shaped body, with a long slender tail, terminating almost in a point. The surface of these drops is smooth and glossy, like that of a common bottle; but on examining them, by placing them between the eye and a piece of white paper in a strong light, their interior exhibits an irregular structure; and it has been proved that they contain cavities, probably formed by the contraction of the glass within after the outer surface has been suddenly cooled by the action of the cold water. The large end of these drops will commonly sustain a pretty smart blow without injury; but the moment the extremity of the point is broken off, they burst into innumerable and almost invisible particles.

Some philosophers have attempted to explain these phenomena, by supposing that, in gradual cooling, the substance of glass assumes a uniform crystalline texture, which enables it in a great measure to resist an external impulse to separate its parts; but that when it is cooled suddenly, only the surface or the thinner parts of the body become crystallized, while the interior not being allowed to exert that expansive force which glass, like water, experiences upon changing from a fluid to a solid state, is constantly endeavouring to expand; so that when the surface is broken, or the thinner crystallized part suddenly separated from the rest, the expansion takes place, and the unannealed glass body is shivered to pieces.

How inadequate this hypothesis is to explain the phenomena of unannealed glass, will readily appear, if it be considered that when a small impulse, such as the breaking off the point of a glass tear, or dropping an angular piece of flint on the surface of an unannealed cup, is sufficient to break that surface and destroy the cohesion of the particles, the same effect should not be produced more readily by a greater blow.

According to another hypothesis, it is the interior and not the surface of unannealed glass that assumes a crystalline state in cooling, similar to what takes place when sulphur and certain metals are melted in a crucible; and soon after the surface hardens, the part remaining fluid is removed through a small opening. Although this opinion be more probable than the former, it is scarcely more useful in explaining the phenomena, as it is difficult to conceive how a crystallized mass should be so easily broken when the compact surface affords so much resistance.

From some late experiments made with glass tears, chiefly with a view to examine their internal structure, and published in the Philosophical Transactions for 1814, it would appear that they generally exhibit certain lines and vacuities, which render it probable that the number of vitreous particles within the tear is proportionally less than those which constitute its surface, and that a vacuum is formed in some part of the interior. Now, if the very thin surface that covers the inner inequalities be attacked as by a sharp-pointed body, or be laid open by breaking off the point of the tear, the sudden admission of the external air, aided perhaps by a change of electricity, which certainly takes place when a glass-tear is broken, may be sufficient to excite such a vibration as will produce a separation of the particles. Should this opinion still be deemed hypothetical, all that can at present be proved is, that an unequal arrangement of the particles of glass takes place when it is suddenly cooled; and that no satisfactory explanation of the mode in which this inequality operates in increasing the brittleness of unannealed glass has yet been advanced.

INDEX.

A
Amethyst, artificial, how made - 41
Annealing of glass described - 31
    uses of - - 42
Antimony, use of, in colouring glass 39
Arsenic, use of, in making glass - 28

B
Base, Mayence, for making artificial gems, how prepared - - 40
Beryl, artificial, how made - 41
Blowing of glass described - 30

C
Carquaises explained - - 36
Clay, best kind of for glass-house crucibles - - - 29
Cobalt used for colouring glass blue 28
Crucibles for melting glass described 29
Cutting of glass, how effected - 31

D
Dial-plates, manufacture of, described 37
Diamond, artificial, how made - 40

E
Emerald, artificial, how made - 41
Enamel, nature of - - 36
    processes for making - ib.
    application of to metallic plates 37

F
Flashing of crown-glass described 34
Fritting, nature and uses of - 30
Furnaces for making glass described 29 & 35
Fusion, directions for - 30

G
Gems, artificial, antiquity of - 27
    how best imitated - 40
Glass-bottle how made - - 32
    coloured, antiquity of - 27
    crown, manufacture of - 33
    nature and properties of - 25
    ingredients of - - 27
    varieties of - ib.
    table, how made - 32
    uses of, - - 27
    flint, manufacture of - 32
    making, theory of - - 42
    plate, manufacture of - 34
    unannealed, properties of 42
    staining, processes for - 39
    manufacture, history of - 26
        apparatus employed in 29
        when introduced into England 27
        into Scotland ib.
        general processes of 30
Gold oxide used for colouring glass 29
Grinding of glass described - 31
    improved method of - 35

I
Iron, oxides of, their use in colouring glass - - - 29

L
Lead, uses of in making glass - 28
Lime, uses of in making glass - ib.

M
Manganese, uses of in making glass 28

N
Nitre, uses of in making glass - 28

O
Opal, artificial, how made - 41

P
Pearls, artificial, history of - 41
    how best made - - 42
Plate-glass, price of, how regulated 36
Polishing of glass described - 31
Potash, use of in making glass - 28

R
Ruby, artificial, how made - 41
Rupert's drops, properties of - 42

S
Sand, kinds of, for making glass 27
Sapphire, artificial, how made - 41
Silver, oxide of, used in colouring glass 39
Soda for making glass, how purified 28

T
Tin, oxide of, use of in colouring enamel 29 & 36
Topaz, artificial, how made - 41

GLASTONBURY, a town of Somersetshire in England, nearly surrounded by the river Brue, consists of two streets crossing each other, and contains two parish churches, two dissenting meeting-houses, an alms-house, and a free school; the population exceeds 2000; and the principal manufactures are silk and stockings. Glastonbury is celebrated for the ruins of a famous abbey, of which a chapel and the abbot's kitchen, a curious structure, still remain.

GLAUBER, John Rudolph, a German chemist, flourished about the middle of the 17th century; spent the early part of his life in travel; and having settled at Amsterdam, was the author of numerous works connected with chemistry, which are strongly tinctured with the alchemical jargon of the times. His name is commemorated in sulphate of soda, or *Glauber's* salt, to which he ascribed extraordinary virtues. *Glauberus Concentratus* is an abridged collection of his works, published in Germany; and an English translation, in one folio volume, appeared in 1689.

GLAUX, Sea-Milkwort, a genus of plants belonging to the Pentandria class, and of which one species is a native of the shores of Britain.

GLAZING is the vitreous covering of porcelain and pottery, intended to render such ware impervious to liquids, or to protect the coloured ornaments from the effects of chemical agents. See Pottery.

GLEDITSCH, John Gottlieb, an elaborate writer on economical botany, was a native of Leipsic, and was born in 1714. Having completed his studies, and taken a degree in medicine, he was appointed to read lectures on botany, physiology, and materia medica at Frankfort on the Oder; and was afterwards admitted to a professorship at Berlin, where he read lectures on the management of forests. He died in 1786. He was the author of various works on the economy and uses of plants; on insects injurious to vegetables; on bees, with regard to which he corrected many errors; and on blowing or drifted sand, with the means of rendering it solid.

GLEDITSIA, Three-thorned Acacia, or Honey-locust, a genus of plants belonging to the Polygamia class, and instituted to commemorate the name of the German botanist Gleditsch.

GLENDALAGH, or the Seven Churches, an ancient town of the county of Wicklow in Ireland, derives its second appellation from the churches, the ruins of which only remain; was first established as a monastery, and afterwards erected into a bishopric, which, at the close of the 15th century, was united to the see of Dublin.

GLINUS, a genus of plants belonging to the Decandria class.

GLIRES, the fourth order of the class Mammalia, according to the Linnæan arrangement of animals. See Mammalia.

GLOBE, a round or spherical body, is applied to denote the earth, and more frequently the artificial representation of it. See Geography.

GLOBULARIA, Globular Blue Daisy, a genus of plants belonging to the Tetrandria class.

GLOUCESTERSHIRE, one of the western counties of England; has for its boundaries on the north and east, Herefordshire, Worcestershire, Warwickshire, and Oxfordshire, and part of Berkshire; and on the south and west, Wiltshire, Somersetshire, the Bristol channel, and Monmouthshire; extends in length, from Stratford-upon-Avon to Clifton beyond the city of Bristol, about 70 miles, nd in breadth from Lechlade to Preston nearly 40 miles and includes an area which has been variously estimated from 705,000 to one million of acres.

Aspect.—Gloucestershire exhibits a greatly diversified aspect, but affords a natural division into three districts, which are distinguished by the name of the *hill*, the *vale*, and the *forest* districts. The hill district includes the Coteswold and the Stroudwater hills, which are regarded as a continuation of the central chain proceeding from Derbyshire into Wiltshire, and terminating at the Land's-end in Cornwall. The range of the Coteswold hills extends 30 miles, from Broadway-hill to near Tetbury. The Stroudwater range of hills partakes both of the Coteswold and of the vale character, and towards its southern extremity presents considerable variety of surface and soil. The vale district comprehends the vales of Evesham, Gloucester, and Berkley, which are distinguished by fertility of soil and the abundance of corn and fruits which it produces. The forest district is separated from the rest of the county by the river Severn, and is principally comprehended by the forest of Dean, which has been long celebrated for the excellence of its timber, and particularly of the oaks, which have afforded the chief supply to the British navy.

Rivers and canals.—The principal rivers of Gloucestershire are, the Severn, which traverses nearly the whole length of the county; the Frome, or Stroud, which joins the Severn at Framilode; the Upper Avon, which divides part of it from Warwickshire; the Wye, forming the boundary with Monmouthshire, and peculiarly celebrated for its natural beauties and picturesque features; and the Thames, which has its source, but runs a very short way in this county. Gloucestershire is intersected by the Thames and Severn, the Stroudwater, the Berkley, the Hereford and Gloucester canals, which greatly facilitate commercial intercourse, and form communications by water with almost every part of England.

Minerals.—The mineral productions are of great value and importance. Lead ore is found in limestone in some parts of the county, but not in sufficient quantity; but the ores of iron are abundant, and the forests of Dean and Kingswood furnish plenty of coal both for domestic and manufacturing purposes. With these essential materials, blomaries or smelting houses for the reduction of the ores of iron, have been long established in this county. Limestone of an excellent quality is also abundant, and sulphate of strontites is found in veins at Aust-cliff near Bristol. The Coteswold hills afford freestone; and numerous animal remains are met with in different parts of the county.

Population.—In the year 1801, the population exceeded 250,000; and in 1811 it was estimated at 278,000. The number of families employed in agriculture is stated at 20,782, and in trade at 29,998.

Husbandry.—The vale of Berkley is chiefly devoted to pasturage; the vale of Gloucester is suitable both for grass and corn; and on the Coteswold hills a regular rotation of crops is practised. In this district, sainfoin has been cultivated for 150 years. The management of the dairy has been brought to great perfection, particularly in the manufacture of cheese, of which from 1000 to 1200 tons are annually produced in the vale of Berkley alone. The perry and cyder, and particularly the Styre cyder, made from an apple of that name, are in great estimation; and in ancient times, numerous and rich vineyards were established in this county.

Manufactures.—Woollen stuffs, chiefly superfine broad cloths, smelting of iron, the making of edge tools, wire, nails, and pins, and establishments for the production of vitriol, red lead, and sal ammoniac, are enumerated among the manufactures which furnish occupation to the inhabitants.

Divisions.—Gloucestershire is divided into four districts, which are subdivided into 28 hundreds, containing about 320 parishes, one city, and 28 market towns. The whole county, with few exceptions, is included within the diocese of Gloucester, which consists of one archdeaconry and ten deaneries.

Gloucester, the capital of the county, stands on the east side of the river Severn, in the vale of Gloucester; has four principal streets, and is peculiarly distinguished by the cathedral, which is a fine structure, with a lofty tower and pinnacles adorned with beautiful fret work. The goal of Gloucester merits commendation, on account of its excellent plan, and the prudence and efficiency of its internal economy.

The population of Gloucester exceeds 8000. The pin manufacture, introduced about the beginning of the 17th century, and first known in England about 1543, still furnishes employment to a considerable proportion of the inhabitants. Pins to the value of L.20,000, are annually sent to the metropolis, but the principal demand for that manufacture is from Spain and America. Before the year 1500, a bell foundery was established; and for the last 150 years, the business has been conducted by successive generations of the same family, who, during that time, have cast more than 3000 bells.

Stroud is situated near the confluence of the rivers Frome and Slade, and is considered as the centre of the clothing manufacture in this part of the county; contains, including the parish, more than 5000 inhabitants; and the water of Stroud river is supposed to possess peculiar qualities in communicating a fine scarlet dye to cloth.

Dursley is a small town of great antiquity, and contains more than 2000 inhabitants, who are employed in the clothing manufacture and in card-making.

Cirencester, once a Roman station, as appears from the remains of antiquity still observed, stands on the river Churn, not far from the borders of Wiltshire, and contains more than 5000 inhabitants, who are chiefly employed in the manufacture of carpets, in breweries, in cutlery, particularly currier's knives, which are highly valued throughout Europe and America.

Fairford, with a population exceeding 1000, stands on the banks of the Colne, and is chiefly celebrated for its fine church, which was erected in 1493 by John Tame, a merchant of London, and the windows were adorned with painted glass taken as a prize in a vessel bound from a Flemish port to Italy.

Cheltenham, which derives its chief importance from its mineral waters, occupies a pleasant situation in the amphitheatre formed by Coteswold hills, and, including the parish, contains more than 3000 inhabitants, eroneously stated, it is suspected, under Cheltenham, at 8000. The first spring was discovered in 1716, and was let by the owner five years afterwards at L.61 Sterling per annum. This spring is of a chalybeate nature. Another spring, discovered in 1803, is of a sulphureous quality. Cheltenham is furnished with spacious and handsome assembly-rooms; an elegant theatre has been lately constructed; and the hotel and principal lodging-houses are commodiously fitted up.

Tewksbury, stands on the banks of the Avon, in the vale of Evesham, contains more than 4000 inhabitants, who are chiefly employed in stocking framework knitting, particularly cotton, in the manufacture of nails, and in malting, which is carried on to a considerable extent.

Clifton, celebrated for its romantic scenery, was first brought into notice about the close of the 17th century, in consequence of its hot springs, which are supposed to be peculiarly efficacious in cases of debility or consumption.

GLOVER, Richard, a poet and writer on commerce and politics, was born in London in 1712. In his sixteenth year he wrote some verses "To the Memory of Newton," and in 1737, appeared his epic poem of "Leonidas," which soon went through three editions, though this success is not a little to be ascribed to the interest taken in it by Lord Lyttleton and others of the opposition party, whose cause he had espoused. Two years after, came out his poem of "London, or the Progress of Commerce," and the same year, the popular ballad of "Hosier's Ghost." At this time he possessed great influence over the opposition party, and distinguished himself often by his eloquence at their elections. Notwithstanding the ardour of his literary and political exertions, Mr Glover had, till about the year 1742, been eminently active in the mercantile profession; but his affairs now getting perplexed, owing to the multiplicity of his other avocations, he retired from business. In 1744, the Duchess of Marlborough bequeathed him and Mallet L.500 each to write the memoirs of her husband, a task which neither of them accomplished. In 1753, the tragedy of "Boadicea" came from his pen, and, eight years after, that of "Medea." In 1761 he was member of Parliament for Weymouth, and, on several occasions, was successful in promoting the interests of trade and commerce. He died in 1785. In 1788 the "Athenaid," a posthumous publication, appeared, but it met with little applause.

GLOW-WORM is an insect which, as the name indicates, emits light from its body during the night; it is the *lampyris noctiluca*, and is a native of Britain. For its history, see Entomology.

GLUCINA, an earthy substance, discovered in 1798, and forming a component part of the emerald and beryl. For an account of its properties, see Chemistry.

GLUCKSTADT, a town of the duchy of Holstein in Germany, is situated at the mouth of the Elbe, stands in a marshy situation, and communicates with the surrounding country by means of a stone causeway. For the encouragement of trade, this place has been endowed with peculiar privileges by the kings of Denmark, to whose authority it is subject; and at one period the commercial intercourse between Denmark and Iceland was carried on through Gluckstadt. The distance from Hamburgh is 28 miles.

GLUE MANUFACTURE.

Glue is a tenacious viscid substance, which is extensively employed in carpentery, bookbinding, and other trades, for the purposes of a cement. It is prepared from the skins and other parts of animals, and possesses very different degrees of tenacity, according to the nature of the materials from which it is obtained; and it has also received different names, as *common glue*, such as is used for cementing different pieces of wood together, *glove-glue, parchment-glue*, and *fishskin-glue*, which latter are commonly distinguished by the name of *size*.

Gelatine or glue appears to be a constituent of almost every part of animals; but it is most abundant in the skin, in the soft and white parts, in every kind of membrane, in bone, and in horns of a hard boney consistence, in small proportion in the blood, and forming the natural cement of many shells.

Chemical properties.—Gelatine is extracted from those substances with which it is combined, by boiling in water for a longer or shorter time, according to the toughness or hardness of the matter employed. The watery solution thus obtained is nearly transparent and colourless; and, when reduced to a small bulk by slow evaporation and allowed to cool, assumes the consistence of a flexible, soft, tremulous jelly. When it is farther evaporated it becomes hard and brittle, and in this state it forms the solid glue of carpenters; or when it possesses less stiffness, it comes under the denomination of *size*.

When gelatine is pure, it is insipid, transparent, and nearly colourless, or with a slight shade of yellow; it has no smell; and when thrown into water, absorbs that liquid, enlarges in bulk, softens, and becomes very elastic. But it is not dissolved without heat, for when it is taken out and exposed to a dry air, it is restored to its original bulk and consistence. After soaking in water, if more liquid be added and heat applied, it soon dissolves and forms a solution similar to the original liquid from which it was prepared, and by cooling returns to the gelatinous state; and unless the heat be too great, this alternate change of bringing it to the liquid and the solid state may be repeated any number of times without alteration of its properties.

Gelatine is not less soluble in acids than in water. Nitric acid acts very powerfully on gelatine, even when it is a good deal diluted. This solution is of a pale yellow colour, and becomes darker as the evaporation advances; but when the solution is concentrated, the acid is decomposed, nitrous gas is evolved, and sometimes flame is emitted. Muriatic acid dissolves gelatine with great facility even in the cold, and this solution remains many months unchanged. Both these acids have the property of separating gelatine from the condensed albumen which is often naturally combined with it in the animal body.

Gelatine is easily dissolved by means of the caustic fixed alkalies, and the compound thus formed is a brownish viscid substance; no ammonia is given out during the solution; the viscid alkaline solution has none of the properties of soap, and when it is saturated with acid no precipitate is obtained. This property is regarded by Mr Hatchett, who instituted the experiments now detailed, as characteristic of gelatine, which is thus distinguished from albumen, fibrine, and most other soft parts of animals, which form a true soap with alkalies, and curdle and precipitate when they are saturated with an acid.

Gelatine is insoluble in pure alcohol, and when alcohol is added to a watery solution of gelatine the mixture becomes milky, and part of the gelatine is separated; but unless a large proportion of spirit is added, the precipitate is re-dissolved and the mixture becomes transparent.

Gelatine, when it is dry and hard, may be preserved for a long time unchanged, but when in the liquid or gelatinous state the process of putrefaction soon commences; it becomes sour, acetic acid is produced, and, finally, ammonia is exhaled. When dry gelatine is strongly heated it curls up and becomes puffy, and like other animal soft parts yields an oily ammoniacal liquor. When heated in close vessels, a bulky soft coal remains behind.

Gelatine combines readily with tan, and these substances form a mutual chemical test of each other. A solution of gelatine, added to an infusion of galls, oak bark, or other vegetable matter containing the tanning principle, produces a copious white precipitate, which forms a grey ductile mass, having when dried, the appearance of resin, and being insoluble in water, and incapable of putrefaction.

When water contains not more than $\frac{1}{100}$ part of its weight of gelatine, it becomes stiff and viscid by cooling, and even with a less proportion, or not more than the $\frac{1}{150}$ part of its weight, it assumes, when cold, the form of jelly. It appears that the degree of viscidity and tenacity in the varieties of gelatine or glue, depends partly on the nature of the substances from which it is obtained and partly on the age of the animal. A stronger glue is extracted from the parts of old animals than from those of young animals, and the toughest skins afford the most adhesive glue. The glue from the skin is also found to be stronger than what is prepared from bones, ligaments, or any other part of the animal.

Common glue.—In France, glue is prepared from the raspings of ivory, the refuse pieces and shavings of the button-mould makers, and other kinds of hard bone. Six pounds of button-mould shavings introduced into a copper-boiler with 24 quarts of water, are soaked for two hours in the cold; the fire is then kindled, the liquid is slowly brought to the boiling point, and is kept at that temperature for nine hours; and, after standing a night, 14 quarts of clear gelatinous liquor are drawn off with a syphon, and two quarts more are pressed from the residue. Being evaporated without addition to a proper consistence, and allowed to subside for half-an-hour, it is sufficiently firm to be divided into cakes, which being dried for a fortnight, yielded about 15 ounces of solid glue, or somewhat less than a sixth part of the weight of the original materials. In another experiment with ivory turnings, nearly the same proportion of glue was obtained. The glue prepared from these clean white bones is at first transparent and nearly colourless, but when it is concentrated by evaporation becomes darker. Immersed in cold water for 24 hours, this glue was found to absorb 15 parts its weight of water, but without any part being dissolved, for when it was dried it acquired its original bulk and weight. Three kinds of glue are usually sold in Paris. The first, or the common glue of the country, is black or opaque; the Flemish glue, which is of a better quality, whitish and transparent; and the third kind, which is imported from Britain, is held in high estimation.

The best account yet published of the manufacture of glue in Britain was drawn up by Mr Clennel, late of Newcastle, and now of Homerton near London, and appeared in the Monthly Magazine for the year 1802. "Glue," he observes, "is an inspissated jelly made of the parings of hides, or horns of any kind, the pelts obtained from furriers, and the hoofs and ears of horses, oxen, calves, or sheep, quantities of all which are imported in addition to the home-supply by many of the great manufacturers. These are first digested in lime-water to cleanse them from the grease or dirt they may have contracted; they are then steeped in clean water, taking care to stir them well from time to time; afterwards they are laid in a heap and the superabundant water pressed out; then they are boiled in a large brass cauldron with clean water, skimming off the dirt as it rises; and farther being cleansed, by putting in, after the whole is dissolved, a little melted alum or finely powdered lime. The skimming is continued for some time, when the mass is strained through baskets and suffered to settle, that the remaining impurities may subside. It is then poured gently into the kettle again, and farther evaporated by boiling and skimming, till it becomes of a clear darkish-brown colour. When it is thought to be strong enough, which is known either by the length of time a certain quantity of water and materials have boiled, or by its appearance during ebullition, it is poured into frames or moulds of about six feet long, one broad, and two deep, where it hardens gradually as the heat decreases. Out of these troughs or receivers it is cut when cold by a spade, into square pieces or cakes, and each of these placed within a sort of wooden box, open in three divisions to the back; in this the glue, as yet soft, is taken to a table by women, where they divide it into three pieces, with an instrument not unlike a bow, having a brass wire for its string. With this they stand behind the box, and cut by its openings from front to back. The pieces thus cut are taken out into the open air and dried on a kind of coarse net-work, fastened in moveable sheds of about four feet square, which are placed in rows in the glue-maker's field, every one of which contains four or five rows of net-work. When perfectly dry and hard, it is fit for sale.

"That is thought the best glue which swells considerably without melting by three or four days immersion in cold water, and recovers its dimensions and properties by drying. Glue that has got frost, or that looks thick and black, may be melted again and refined, with a sufficient quantity of fresh added, to overcome any injury it may have sustained; but it is generally put into the kettle along with what has been purified in the second boiling. To know good from bad glue, it is necessary for the purchaser to hold it between his eye and the light; and if it appear of a strong dark brown colour, and free from cloudy or black spots, it is of a good quality."

Isinglas.—This substance, which is a thin, flexible, tough, whitish membrane, in the form of irregular shreds, or clippings loosely coiled up, and of various degrees of fineness and flexibility, is prepared from several parts of the entrails of different fishes, merely by boiling, cleansing, and drying. The best kind of isinglas is the thinnest, most flexible, and has the longest *staple.*

The manufacture of isinglas is almost confined to the Russian empire, and is extensively carried on at those places where the sturgeon and other congenerous fishes are abundant, as on the Volga, the Dnieper, and the Don towards the Caspian sea.

The isinglas obtained from the sturgeon is of the best quality, and the membranes from which it is extracted are various extensions of the peritoneum, and more particularly the air-bladder or sounds, which in the sturgeon is very large. When the sounds are taken out of the fish, they are washed with cold water, and exposed for some time to the air to stiffen. The external membrane is then taken off, and rejected, while the remainder is cut out and loosely twisted into rolls according to the intended size of the staple. The rolls are pegged down on boards, and hung up on lines to dry. No farther preparation is employed. An inferior kind of what is called cake isinglas, is prepared from the clean shreds of the twisted sort. These shreds are put into a flat metal pan with a very small quantity of water, and giving it what heat is necessary to produce a cohering mass, which is afterwards dried.

Good isinglas, which is considered the finest and purest kind of animal gelatine, has neither taste nor smell; when soaked in water, it swells, softens, and if held up to the light appears opalescent, and readily and entirely dissolves in warm water, forming the clearest and most colourless jelly. When isinglas is much concentrated by evaporation, it forms a very delicate cement for uniting glass. For this purpose it is peculiarly suitable, as it is perfectly transparent and destitute of colour.

Size.—Glue, or jelly, which is generally distinguished by the name of size, is prepared, by boiling down in water the clippings of parchment, glove-leather, fish skin, and some other kinds of skin and animal membrane. The solution is then strained and evaporated to a proper consistence. Glue of this kind, or size, is either used alone or mixed with vegetable tenacious substances, as flour-paste, gum arabic, or gum tragacanth, and it is usually employed by gilders, book-

Glue.

binders, house-painters in distemper, and paper hangers. The skins of eels and other fishes furnish a kind of glue which is much esteemed for its transparency and tenacity.

Method of using glue.—When common glue, as it is employed by the carpenters, is to be used, it is broken into pieces, covered with cold water, and allowed to stand for 24 hours, when it swells up and absorbs a large quantity of the liquid. The soaked pieces, without the addition of more water, are melted over a slow fire, and with frequent stirring are kept simmering for a quarter of an hour. When it is removed from the fire and cooled, it becomes a firm jelly, of such a consistence as readily to be cut with any instrument, but too stiff to be tremulous. When in this state, nothing more is necessary than to warm it, which renders it sufficiently fluid to be spread with a stiff brush over the surface of the wood. Wood that is joined by glue requires from one to three days to be strongly united. This is known by the hardness of that part of the glue which remains on the outside of the joining. As the return of the glue to the solid state, and consequently its cementing power, depend on the evaporation of the redundant water, wood cannot be glued together at the freezing temperature; but if the glue be of good quality, and the operation be properly conducted, the force of cohesion is so great, that boards of the thickness of those used for ordinary purposes of furniture give way by violence as readily at the solid part as at the joining.

Glue.

Gluten
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Gmelin.

GLUTEN, a tenacious, ductile, soft, elastic mass, which is obtained from wheat-flour. See CHEMISTRY.

GLUME, a term in botany, denoting a kind of calyx composed of two or three membranous valves, and peculiar to the grasses. See BOTANY.

GLYCINE, KNOBBED-ROOTED LIQUORICE VETCH, a genus of plants belonging to the Diadelphia class.

GLYCYRHIZA, LIQUORICE, a genus of plants belonging to the Diadelphia class.

GMELIN, JOHN GEORGE, a physician and botanist, was born at Tubingen in Germany in 1709. He took his doctor's degree in 1727; and having, about this time, paid a visit to Petersburgh, he was admitted a member of the academy, and made professor of chemistry and natural history. In 1733, Gmelin, with two other men of learning and inquiry, were sent by the Russian government to Siberia to make geographical discoveries; and, after being engaged nine years in researches which tended much to the interests of science, he returned to Petersburgh and re-commenced his literary functions. In 1749 he succeeded to the professorship of Bachmeister. He died of a fever in 1755. Gmelin was one of the first botanists of the eighteenth century. The account he gives of Siberia in the history of his researches in that country, and his description of the boundaries between Europe and Asia, have been adhered to by the best geoprapbers since his time; and in these accounts he records many facts in natural science, and relating to manners and customs, alike distinguished for their novelty and importance. His works are, "Flora Siberica, seu Historia Plantarum Siberiae," and "Travels in Siberia," &c.

GMELIN, SAMUEL GUTLIER, a learned naturalist, was a native of Tubingen, and born in 1743. In his twentieth year he was made doctor of medicine, and shortly after appointed professor in the academy of Petersburgh. In 1768, Gmelin was sent by Catharine II. to explore the province of Astracan, and, on returning home, was seized by a savage chan, who plundered him of all he had and put him in prison, where he treated him with great cruelty, the effects of which, and the previous state of his health, brought on the illness which ended in his death in 1774, after he had been confined for six months. He was much lamented by the empress, who was unable to effect his freedom on account of a rebellion which was raised at that time. His works are, "A History of the Fuci," to which plants little attention had been paid before his time, and "Travels through Russia," both 4to.

Gmelin
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Gnidia.

GMELIN, JOHN FREDERIC, a distinguished naturalist, and disciple of the celebrated Linnæus, was also a native of Tubingen, where he was born in 1748. He died early in the present century; but in what year is uncertain. Some years before his death he was appointed professor of chemistry in the university of Gottingen; but he is best known as the editor of the 13th edition of the *Systema Natura* of Linnæus, published at Leipsic in 1788, in seven volumes 8vo. In conducting this last Latin edition of the Swedish naturalist's great work, Gmelin displayed more learning and research than genius or accurate knowledge of his subject. He greatly increased the number of species, especially in the animal kingdom, by introducing the recent discoveries of contemporary naturalists and travellers; but in executing this useful office, he betrayed much want of judgment, sometimes admitting varieties as species, and not unfrequently repeating the same species under different names. This work is characterized by Cuvier as entirely indigested and devoid of critical discrimination and accurate knowledge of the objects; but yet necessary, as forming the only tolerably complete table of what had been done previous to the year 1790. In 1795 Gmelin published at Gottingen two volumes of *Apparatus Medicaminum*, containing an account of the minerals employed in medicine, and intended as a supplement to Professor Murray's work under the same title.

GMELINA, a genus of plants belonging to the Didynamia class, the species of which are natives of India.

GNAPHALIUM, CUDWEED, or EVERLASTING FLOWER, a genus of plants belonging to the Syngenesia class.

GNEIS, a compound rock of a laminated structure, and consisting of feldspar, quartz, and mica. See GEOLOGY.

GNIDIA, a genus of plants belonging to the Octandria class.

GNOMON, the stile of a dial, which, by its shadow, marks the hour of the day. See DIALLING. The same word is also employed in astronomy, and denotes a stile erected perpendicular to the horizon, for the purpose of finding the altitude of the sun.

GNOSTICS were a sect of philosophers who accomodated their interpretations of sacred Scripture to the doctrines of Pythagoras and Plato; but this appellation became afterwards more general, and was applied to all those who corrupted the doctrines of revelation with a mixture of the tenets of ancient philosophy.

GOA, a town on the Malabar coast in the peninsula on this side of the Ganges, and the chief settlement of the Portuguese in the East Indies, stands on an island of the same name, which is about twelve miles in length and six miles in breadth. The island is separated from the continent by an arm of the sea which is about three miles broad. The new city of Goa is situated at the entrance of the harbour; and eight miles higher is the old city, which is built in the form of an amphitheatre, and is encompassed with finely wooded hills. The harbour is a spacious basin, and the banks of the river are richly adorned with churches, castles, and private mansions. The churches and some of the public buildings are magnificent structures; the market-place is a spacious area; and the shops were formerly furnished with the productions of Europe, India, and China. But this place, which was once crowded with inhabitants and enjoyed a lucrative commerce, has fallen greatly to decay. The trade is now chiefly confined to rice, arrack, and oil.

GOBELIN, GILES, a famous French dyer, who flourished in the reign of Francis I. and discovered the method of communicating to cloth a beautiful scarlet. The place in which he conducted his operations, in the suburb of St Marcel at Paris, still retains the name of the *Gobelins*. In the same quarter, a manufactory of fine tapestries was erected in 1666, from which tapestries are sometimes distinguished by the name of *gobelins*.

GOBIUS, GOBY or SEA GUDGEON, a genus of fishes belonging to the order of Throracici. See ICHTHYOLOGY.

GOGUET, ANTONY YVES, a learned French author, was born at Paris in 1716, and became a counsellor to the parliament; but he is chiefly distinguished as the author of the "Origin of Laws, Arts, and Sciences, and of their Progress among the Ancients," which was published, in 1758, in 3 vols. 4to, and has been translated into English. The industry and erudition of the author are peculiarly conspicuous in this work, in which the origin and progress of human knowledge are traced from the creation to the time of Cyrus. The author enjoyed the literary reputation which he acquired by this work only for a short time, for he was carried off by the small pox in the same year in which it was published.

GOLCONDA, a province of Deccan in India, included by the rivers Kistnah and Godavery, is about 200 miles from north to south, and 220 miles from west to east; has for its boundaries on the north and west Berar and Visiapour, and on the south and east the kingdom of Mysore and the Northern Circars; was reduced under the authority of Aurengzebe in 1687; and now constitutes the chief possession of the Nizam or Soubah of the Deccan. This province is extremely fertile, and produces abundant crops of grain and rice, and in some places the vine is successfully cultivated. But it is chiefly remarkable for its diamond mines in the vicinity of Raolconda.

GOLCONDA is a strong fortress situated on a hill, about six miles from Hydrabad, in the province of the same name, and was once the capital of an extensive kingdom. On account of its strength and security the principal inhabitants and bankers of Hydrabad are permitted by the Nizam to have houses within the fort, to which they retire with their money and effects in case of any hostile alarm.

GOLD, one of the precious metals, for the natural history of which see GEOLOGY, and for its properties and combinations see CHEMISTRY.

GOLD-BEATING, the ingenious art of reducing gold to extremely thin leaves for the purpose of gilding. See GILDING and METALLURGY.

GOLDONI, CHARLES, an eminent dramatic writer, was a native of Venice, and was born in 1707; discovered even in his childhood a strong propensity to the drama, and in his eighth year sketched the plan of a comedy of his own invention. His education at the Jesuits college at Perugia and Rimini was scarcely completed when he joined a company of comedians; and having remained with them some time, his father in vain attempted to induce him to prosecute the study of the law, which was his own profession. While at Milan, in the character of secretary to the Venetian resident, he produced his first piece for the stage, *Il Gondoliere Veneziano*, and soon after removing to Verona attached himself to a company of players, for whom he composed several pieces. After visiting various places in Italy he returned to Venice, and possessed so much fertility of genius, and such indefatigable industry, that in the course of a single year he produced sixteen comedies, besides 42 other pieces for the stage. The first edition of his works appeared in 1753, in 10 vols. 8vo.

About the year 1761 Goldoni was invited to Paris, under an engagement for two years, to be composer for the Italian theatre in that capital; and during his engagement he produced 24 dramatic pieces. He was then appointed Italian master to some of the royal family. He was even successful in two comedies written in the French language. When Louis XVI. ascended the throne, Goldoni was appointed Italian teacher to two of the princesses, but the infirmities of age compelled him to retire from the bustle of a court; and at the commencement of the revolution he was deprived of his pension and reduced to poverty. He died in 1792, when he had reached the 85th year of his age. The works of this comic author, who had the merit of reforming the Italian stage, were printed at Leghorn in 31 vols. 8vo. in the years 1788 and 1791.

GOLDSMITH, OLIVER, an elegant writer in poetry and prose, was born in 1728 in the parish of Forney, and county of Longford, in Ireland, and was the son of a clergyman of the established church. His elementary education was begun in his native

Goldsmith.

village, and was afterwards prosecuted successively at Elphin, Athlone, and Edgeworthstown;—and he was admitted in his 15th year a sizer of Trinity college, Dublin. At college he was unfortunate in his tutor, a man of a savage temper, whose ill treatment of his pupil seems to have made him idle from despair. On one occasion the tutor found a company of young people making merry in Oliver's rooms, and belabouring their entertainer before their eyes rudely broke up the party. This disgrace drove him from the university; and as he wandered about without an object, he was reduced to such extreme distress for want of food, that he regarded a handful of grey pease, which he received from a girl at a wake, as the sweetest repast he had ever enjoyed. He returned home, was re-admitted into college, and obtained the degree of batchelor of arts two years after the usual time.

Soon after this he became a tutor in a gentleman's family, a situation which he retained till he had saved L.30, with which he bought a horse, and like a knight-errant set out in quest of adventures. His friends knew nothing of him till he returned pennyless at the end of six weeks. He said he had been at Cork, had paid his passage to America, and that the ship had sailed while he was thoughtlessly surveying the curiosities of the place.

His uncle, the Rev. Mr Contarin, who had borne the principal part of his college expenses, next sent him to Edinburgh to study medicine; and having attended the medical lectures in that university, he was permitted by his uncle to proceed to Leyden to complete his studies. A debt for which he had become bound hastened his departure from the metropolis of Scotland; and he was saved from arrestment only by the interference of a friend. The ship in which he sailed was bound for Bourdeaux, but was driven into Newcastle by stress of weather; and Goldsmith proceeded to Holland from that town, while the ship for France proceeded on her voyage and was wrecked. At Leyden he studied chemistry and anatomy for a year; but spent much of his time and most of his money at the gaming-table, and then set out on a pedestrian tour through Europe. In this romantic expedition he subsisted himself scantily by playing on the flute to the peasantry, and by disputing at the different universities. In this way he traversed Flanders, France, Germany, and Switzerland, where he sketched his poem of "the Traveller." He arrived in London in extreme distress, and was for some time usher in an academy, then assistant to a chemist, next a medical practitioner, and last of all an author by profession.

He first proposed to publish, by subscription, an "Inquiry into the present state of Polite Literature in Europe," with the view, as it is said, of enabling him to defray the expense of getting to India as physician to one of the factories, a situation to which, through the interest of Dr Milner, a dissenting clergyman, he had been appointed; but which, for some unknown cause, he never enjoyed. He was afterwards employed as a writer for the Monthly Review; after a few months he left this employment, took lodgings, and finished his "Inquiry into the State of Literature," which was published in 1759. He then conducted the Lady's Magazine; wrote a volume of essays entitled "The Bee; "Letters on English History;" "Letters of a Citizen of the World;" and the "Vicar of Wakefield.' About this time he was found by Dr Johnson, in lodgings in Fleet-street, so greatly involved in debt and destitute of credit, that he was immured by bailiffs from without, and threatened with expulsion by his landlady from within. The sale of the "Vicar of Wakefield" for L.60, relieved him from distress, and the popularity of the novel brought him into public notice. Yet his conduct in respect to money matters continued to be marked with much imprudence; his ambition of shining in conversation made him too frequently the laughing-stock of those with whom he associated; and his ignorance of the ways of the world, even in spite of experience, rendered him unfit to raise himself to a station suited to his great and original abilities. He lost his money at the gaming-table, was the butt of witlings and the dupe of impostors; and when he waited on the Earl of Northumberland with a studied address, he threw away his compliments on his lordship's steward, and then told the nobleman "that he had no confidence in the patronage of the great, but would rather rely on the booksellers." He indeed relied almost entirely on the booksellers; for his Roman and English histories, his lives of authors, and introductions to books, and his history of Animated Nature, were all written as task-work for that body. The Vicar of Wakefield and the Traveller were both printed in 1765, and established his fame,---his ballad of Edwin and Angelina the year following. His Good Natured Man appeared in 1768, and changed the reigning fashion of comedy from tasteless sentiment to harmless merriment. His Deserted Village was published in 1769, and his comedy, She Stoops to Conquer, in 1773, which nearly completes the list of his works. He indeed contracted for new books with the booksellers, engaged to write comedies for both the theatres, and projected a Universal Dictionary of the Sciences; but he died of a fever in the 46th year of his age, without having accomplished any of these designs.

With all his weakness and eccentricity Dr Goldsmith must have possessed many estimable and valuable qualities, which made him the object of affection with some of the greatest of his contemporaries. He was one of the earliest members of the Literary Club; and Burke, Reynolds, Johnson, Garrick, and other men of known celebrity, were his companions and friends. The purity, simplicity, and elegance of his prose, and the polish, tenderness, and pathos of his poetry, are too well known, and too highly appreciated, to require either to be characterised or recommended.

GOLF, a field game, which is a favourite amusement in some parts of Scotland, and is played with clubs and balls. See GAMES.

Gombroon.

GOMBROON, a town of the province of Kerman in Persia, stands on a bay of the gulf of Ormuz, is strongly fortified, was at one time the chief sea-port of Persia, and is still a place of considerable trade. The English formed an establishment at Gombroon about the beginning of the 17th century, and soon after the Dutch had a similar settlement. The surrounding territory furnishes abundance of grain and excellent fruits; but water is scarce, and the climate is unhealthy.

GOMERA, one of the Canary islands, is about six leagues distant from Teneriffe, and is about 20 miles in length and 10 miles in breadth; has a spacious and secure harbour, which is defended by a battery; and the chief town of the island, St Sebastian, stands at the bottom of a bay on the south-east side. The population is stated at 7000.

GOMPHRÆNA, Globe Amaranth, a genus of plants belonging to the Pentandria class.

GONDAR, the capital of Abyssinia, stands on the flat summit of a hill which is surrounded by a deep valley; the houses are constructed chiefly of clay, and are covered with thatch. The palace is the principal public building, and although much of it was in ruins when Mr Bruce visited Abyssinia, the remains still exhibit striking marks of its former magnificence. The population is stated at 50,000; and a kind of coarse carpet of the wool of the sheep and hair of the goat, of a red or blue colour, is enumerated among the principal manufactures.

GONIOMETER, an instrument employed for the measurement of angles, and especially the angles of crystallized mineral substances. An instrument of this description was used by Romé de Lisle; and another, invented by M. Carangeau, is described by M. Hauy in his treatise on mineralogy; and improvements have been proposed by Dr Wollaston and others.

GOOD HOPE, Cape of, a promontory at the southern extremity of Africa. See Cape of Good Hope.

GORDIUS, the Hair-worm, a genus belonging to the class of Vermes. See Helminthology.

GORDON, Alexander, a learned author of the 18th century, was a native of Scotland; was an excellent classical scholar; and, after a long residence in Italy and other parts of the continent, he was appointed, on his return, secretary to the Antiquarian and other societies. He afterwards held various public offices in the province of Carolina in America, and died in that country. Mr Gordon is chiefly known as the author of "Itinerarium Septentrionale, or a Journey through most parts of Scotland, in 1726," in folio; and additions and corrections to the above, containing an account of Roman antiquities in Scotland, and ancient monuments in the north of England, 1732, folio.

GORDON, Thomas, a political writer about the beginning of the 18th century, was a native of Kirkcudbright in Scotland; and having completed an academical education in his own country, settled in London as a teacher of languages. He commenced his career of political authorship in the time of queen Anne, took a part in the Bangorian controversy; with Mr Trenchard, had a joint concern in "Cato's Letters" and the Independent Whig; and wrote in defence of Sir Robert Walpole's measures. But he is now chiefly known as the translator of Tacitus in 1739, and of Sallust in 1743. He died in 1750.

GOREE, a small island near Cape Verd on the coast of Africa; and although not more than two miles in circumference, yet it has been deemed of great importance in facilitating the trade in that part of Africa; has been often the subject of a struggle between different European powers for its possession; and has been alternately in the hands of the Dutch, French, and English.

GORGONIA, a genus of zoophytes, which includes sea-feathers and sea-fans. See Helminthology.

GORITZ or Gorz, a town of a district of the same name in Germany, occupies a fine situation on the river Lisonzo, contains some excellent houses, and some elegant public buildings. On one side of the surrounding territory, the unequal surface presents some picturesque scenery, and on the other stretches an extensive plain, which produces abundance of grain, fruits, wine, and silk. The population of Goritz is estimated at 12,000.

GORLITZ, a town of Upper Lusatia in Germany, stands on the river Neisse; contains more than 8000 inhabitants, who are actively employed in the manufacture of woollen, linen, and cotton stuffs.

GOSLAR, a town of Westphalia in Saxony, stands on the river Gose, and contains about 6000 inhabitants, who are occupied in the manufacture of paper, fishing nets, vitriol, and a peculiar kind of beer, which has acquired great celebrity.

GOSPORT, a town of Hampshire in England, stands on the west side of Portsmouth harbour. The population is stated at nearly 8000; and an iron foundery and several breweries furnish employment to many of the inhabitants.

GOSSYPIUM, Cotton-plant, a genus of plants belonging to the Monadelphia class. See Botany.

GOTHA, a town of Thuringia in Germany, is situated on a rising ground near the Leine, contains some handsome public buildings, and particularly the ducal palace, which is furnished with a museum of natural history and an excellent library. The population exceeds 11,000, and the chief manufactures are woollen stuffs, muslins, and porcelain. The observatory on the mountain Seeberg, and under the direction of baron Zach, an excellent and indefatigable astronomer, is in the vicinity of Gotha.

GOTHARD, St, one of the highest mountains of Switzerland, is more than 9000 feet above the level of the sea, and from its summit affords one of the most extensive prospects of picturesque scenery in the world. The lower regions are clothed with thick woods, but the upper parts are nearly destitute of vegetation.

GOTHLAND, a district of Sweden, which has for its boundary on the west the Sound, the German ocean, and Norway, Sweden proper on the north, and the Baltic on the east and south. It is divided into three provinces, which are distinguished from their position by the names of West, South, and East Gothland.

West Gothland is bounded on the north by Wermeland, on the east by Nericia, the Wenner lake and Smaland, on the south by Smaland and Halland, and on the west by the Scaggerac; is more than 100 miles long and 15 miles broad; and was once an independent kingdom, governed by its own laws. The soil in many places produces corn and fruits, while the pastures afford nourishment to numerous herds of cattle, and enable the inhabitants to export the produce of the dairy to other parts of the kingdom. The inhabitants are chiefly employed in the labours of agriculture and fishing, and the manufacture of alum and paper has been long carried on, while the mines furnish materials for the smelting of iron. The principal towns are Gottenburg, Wennesburg, Lidkioping, and Falkioping.

South Gothland comprehends three divisions or provinces, Schonen, Halland, and Bleckingen, which have often changed masters, sometimes acknowledging the authority of Denmark, and sometimes subject to the crown of Sweden; but finally annexed to the Swedish dominions by Charles Gustavus in the year 1658, according to the treaty of Roschild.

East Gothland is bounded on the east by the Baltic, on the south by Smaland, on the west by the Wenner lake, and on the north by Nericia and Sudermanland; is about 80 miles in length and 70 miles in breadth; produces grain of various kinds, abounds in rich meadows and pastures, and the lakes and rivers are stored with various kinds of fish. The forests of oak and birch are extensive, and numerous iron-works and founderies have been established. Nordkioping, Soderkioping, Linkioping, and Wadstena are the principal towns.

GOTHS, a warlike people who inhabited the northern regions of Europe, included under the general appellation of Scandinavia, and comprehending Sweden, Norway, Lapland, and Finmark; and who form a remarkable feature in history, by their invasion of the southern parts of Europe, and particularly of the Roman empire, which yielded to their victorious arms, and became finally subject to their power.

GOTTENBURG, a sea port town of West Gothland in Sweden, stands on the banks of the river Gotha, which has its source in the Wenner Lake. The town is about three miles in circumference, and is surrounded with a ditch and wall. From the inequality of the surface, it is divided into the upper and lower town, and the houses of the latter division, from the marshy nature of the soil, are built upon piles. The principal street, in which are the exchange and the East India house, a large edifice, is crossed at right angles by the other streets, and some run parallel to it. The harbour is formed by a double chain of rocks, and is defended at its entrance by a small fort.

The population of Gottenburg is about 25,000. The principal exports are, iron, wood, and herrings; of which latter the fishery was at one time so extensive, that 600,000 barrels were taken annually. The importation of East India produce was formerly very considerable.

GOTTINGEN, a city of Lower Saxony, and now included in the kingdom of Hanover, contains about 12,000 inhabitants. The chief manufactures are woollen stuffs and hats; but Gottingen has acquired more celebrity by its university, which was established in the year 1734 by George II. The library is a very extensive collection; and a museum of natural history, an observatory, other literary and scientific institutions, are connected with this seminary, which ranks among its members, Mosheim, Michaelis, Lichtenberg, Burger, Beckmann, Heyne, Blumenbach.

GOUDA, a town of Holland, situated on the Issel, a branch of the Rhine; has a considerable trade in cordage, tobacco-pipes, and cheese; and was formerly famous for the number of its breweries, which supplied great part of Flanders with beer; but it is chiefly remarkable for the painted windows which adorn the magnificent cathedral, and which have been preserved with great care.

GOUDT, Henry, commonly called Count Goudt, was descended from a noble family at Utrecht; and having a strong predilection for painting and engraving, rose to a distinguished rank in those arts. He was born about the year 1575; but some years before his death he fell into a state of idiotism, the consequence, it is said, of a love-potion, which had been secretly administered to him. See Design.

GOVERNMENT, in its usual meaning, is the political constitution of a state, by which security and order are preserved. Three kinds of government are usually alluded to by writers on civil institutions,—the despotic, monarchical, and republican. In a despotic government, the supreme authority is assumed by a single individual, and his will is the sovereign law. Such is the government that exists in the early stages of society; and such also seems to be the government of Turkey and China at the present day. Opposed to this is the republican form of government, in which the rulers are chosen by the people, and usually for a limited time. The states of Holland in former times, the cantons of Switzerland, and some of the smaller states of Italy, afford examples of this form of government. The monarchical government, in which the affairs of the state are regulated and managed by fixed laws, may be considered of a mixed kind; for although the sovereign authority is entrusted to a single individual, the laws, according to which that authority is executed, are made by the representatives of the people, in conjunction with the sovereign. The British government is of this kind, in which the laws framed in the houses of Parliament, having received the sanction of the sovereign, are placed in his hands for the purpose of being duly executed. The reader who wishes to pursue this subject, is referred to Montesquieu's *Spirit of Laws*, and Locke on *Government*.

GOWER, John, one of the oldest English poets, and the cotemporary of Chaucer, flourished in the 14th century, and died in the year 1402. He had been in the profession of the law, and had acquired affluence, for he contributed to the rebuilding of the church of St Mary Overee in Southwark, where his tomb is still seen. He was the author of "The Mirror of Meditation," a moral treatise, in French rhyme; of "The Voice of One crying in the Wilderness;" a metrical chronicle of "The Insurrection of the Commons under Richard II." in Latin elegiac verse; and "The Lover's Confession," an English poem, in eight books; which last only has been printed, and is one of the earliest productions of the English press. It was printed by Caxton in 1483.

GOYEN, John Van, an eminent Dutch painter of landscapes, cattle, and sea-pieces, was born at Leyden in 1596, and died in 1656. Some of his works are still held in considerable estimation.

GRADUATION is the method of constructing or dividing the scales of mathematical instruments, an operation of vast importance in physical science. This ingenious art has been brought to great perfection in this country. Those who wish to be familiar with what has been done on this subject may consult the account given of Ramsden's engine, published by the board of Longitude in 1777, and a valuable memoir on the same subject, by Mr Troughton, which appeared in the Transactions of the Royal society for 1809.

GRAFTING is the method of inserting the shoot of one tree into another, that it may produce fruit similar to that of the tree from which the shoot is taken. For the different methods of performing this operation, see GARDENING.

GRAHAME, JAMES, author of the popular poem "The Sabbath," was born in Glasgow in 1765, and received the earlier as well as the academical part of his education in the schools and university of that place. In his 20th year he was bound apprentice to his relation, Mr Hill, writer to the signet in Edinburgh; and having become a member of the society of writers to the signet, he continued for a short time in that profession. But, disliking its minute details or the bustle and activity which it required, as little congenial to his retired habits, he communicated to his friends his intention of qualifying himself for the office of a clergyman in the church of Scotland, thus reviving a former predilection for the clerical profession. By their advice it is understood he changed his resolution, and returned to his native city for the purpose of attending the excellent lectures of Mr Millar on the principles of law, with the view of qualifying himself to practise at the bar. About this time the first productions of his muse issued from the press, in an anonymous volume of poems in English, Scottish, and Latin, printed at Paisley in 1794. This motley collection, of which the merit is undoubtedly extremely various, the author and his friends were afterwards anxious to sink into oblivion. It might have been greatly improved by pruning and selection; and although the satire against irregular conduct and bad habits is perfectly legitimate, yet it is highly creditable to the kindliness of Grahame's disposition, that he regretted wounding the feelings even of the mean or dissipated. The Latin poems in this collection, and particularly the translation of Burns' poem on the mouse turned up by the plough, afford the best proofs of his classical learning.

Mr Grahame was admitted an advocate in 1795, and continued to practise as a lawyer at the Scottish bar till 1808, when either the want of relish for the profession, or the state of his health, or perhaps both, made him once more turn his thoughts to the church. About this time he took orders in the church of England, entered on a curacy in Gloucestershire, and finally settled with a similar charge in the county of Durham; and to his praise it ought to be recorded, that he was not slow in pleading the cause of humanity wherever his talents and exertions as a Christian minister could be effectual. He preached several charity sermons in Durham,—the object of one of which was the release of a poor shoemaker from prison for a small debt, and in another he contributed to the relief and comfort of the ingenious inventor of the life-boat, whom misfortune had thrown into a similar situation. But an insidious disease was fast undermining a constitution which had been long feeble, and had never been vigorous; and having returned to Scotland in harvest 1811, he had experienced the sympathy and affection of his relatives and friends only for a few weeks when it brought him to the grave in the 47th year of his age.

Mildness, benevolence, and humanity, were conspicuous features in the character of James Grahame; and these amiable qualities served in him to smooth the asperities of political discussion and party spirit, which his biographers triumphantly say he had acquired in the school of Millar at Glasgow. The reputation of Grahame as a poet rests on "The Sabbath." The vigorous strain of rational sentiment, and the warm glow of pious feeling that pervade this fine poem, will support it in that degree of popularity which it has justly attained, as long as the serious thoughts and sacred duties appropriated to the day which it so happily commemorates are regarded and respected among men. The other productions of his muse, "Mary Queen of Scots," a tragedy, "British Georgics," "The Birds of Scotland," and some shorter occasional pieces, are of inferior merit, although the author's benignity of heart and tenderness of feeling can scarcely fail to induce the less fastidious reader to throw a veil over many imperfections.

GRAINGER, JAMES, a physician and poet, was a native of Berwickshire in Scotland, and was born in 1724, received his medical education at Edinburgh, and served some time in the army as a surgeon. He settled in London in 1748, and became known as a poet by the publication of his "Ode on Solitude" in Dodsley's Collection. The encouragement which Dr Grainger met with in London to pursue the medical profession is understood to have been inconsiderable; and this want of success led him to undertake the superintendance of the education of a young man of fortune from the West Indies. He afterwards accompanied his pupil to St Christophers, and finally settled as a physician at Basseterre in that island, where he died in 1767, greatly esteemed and regretted for his generosity and benevolence. During his residence in the West Indies, he composed "The Sugar Cane," a didactic poem on the culture of that plant, which was published in 1764. He was also the author of a translation of the Elegies of Tibullus; but neither of the latter works supports the reputation which he had gained by his "Ode on Solitude."

GRALLÆ, one of the orders of Birds according to the Linnæan arrangement. See ORNITHOLOGY.

GRAMINA, the Grasses, a natural tribe or family of plants, which constitutes the fourth order in the natural method proposed by Linnæus.

GRAMMAR has been defined the art of speaking and writing any language with propriety. This definition refers to particular grammar. But considering language as the vehicle of thought, the principles of its construction constitute what has been distinguished by the name of philosophic or universal grammar. See LANGUAGE.

GRAMPIAN MOUNTAINS, a lofty range which traverses Scotland from the banks of Lochlomond to the Moray firth, and is chiefly composed of primitive rocks, as granite, gneiss, micaceous and argillaceous schistus.

GRANADA, a province of Spain, bounded on the west and north by Andalusia, on the east by Murcia, and on the south by the Mediterranean, is about 200 miles in length from east to west, and from 40 to 70 in breadth from south to north.

Aspect, climate, and soil.—The external outline of this part of Spain is extremely irregular, both along the coast and its line of demarcation with the conterminous provinces. As it is traversed by several mountain ranges, especially by those known by the name of the Alpuxarras, and the Sierra Nevada, some of the summits of which exceed 12,000 feet in height above the sea, and are covered with perpetual snow, its surface exhibits a high degree of diversity, combining all the sublime and beautiful scenery formed by towering mountains, expansive plains, and smiling valleys. Though it cannot boast the possession of any of the majestic rivers of Spain, which enrich and beautify so many districts of that kingdom, it is watered by numerous streams flowing both towards the south, the north, and the west, as they receive a direction at their source from the inclination of the ground through which they form their channel. The most considerable rivers are the Xenil, and the Barbata, both branches of the Guadalquiver. The climate is of course as various as the surface is diversified. While the valleys are scorched with excessive heat, the mountain tops are hardened with everlasting frost, and the temperature of the intermediate space is greater or less in proportion to the small or great degree of its elevation. The Solano, a hot wind which blows from Barbary, occasionally withers the vegetation, and produces fevers and other diseases among the inhabitants. The soil is equally various as the climate; it is extremely fertile in the valleys, and comparatively barren among the mountains.

Productions.—Granada contains a great deal of mineral riches. Marble of different colours is abundant, as well as jasper, serpentine, and alabaster. In some of the mountains are mines of silver, copper, and lead; small quantities of gold are also found in the beds of the Darro and some of the other streams. Mineral springs both cold and hot, chalybeate and sulphureous, abound in the province. Vegetable productions are rich and various, among which are wheat, rice, flax, hemp, mulberry-trees, olive-trees, vines, sugar-canes, indigo, and coffee. The Viga (orchard) de Granada, a very fine valley in which the capital is situate, is said to yield 50 bushels of wheat per acre without manure. Irrigation, where practicable, is in general use, and the province on the whole is in a tolerable state of cultivation. The breeding and fattening of cattle and sheep are also branches of the rural economy of this part of Spain; and as the grass grows abundantly in winter, the farmers do not need to make hay.

Inhabitants.—The population is said to amount to 600,000; the men are vain, talkative, and boastful, the women are handsome and peculiarly attractive as dancers. Corn, wine, and dried fruits, are exchanged with the neighbouring provinces for oil and silk; wine, raisins, oranges, olives, figs, almonds, capers, honey, wax, anchovies, and metals, are exported, and among the imports are cloth, iron-ware, mercury, and lace.

Cities.—The capital of the province is a city of the same name, built by the Moors, at the termination of a fertile and extensive valley, surrounded by lofty mountains though it be raised 1200 feet above the level of the sea. It is built chiefly on two hills separated by the river Darro, and its walls are bathed by the larger stream of the Xenil. On approaching the city it assumes the appearance of a crescent; streets, with their numerous turrets and gilded cupolas, rise above streets, while the Alhambra, the palace of the Moorish kings, crowns the whole. The streets are narrow and irregular, and the public edifices are hastening to decay. The buildings of the Alhambra are so arranged, and are so extensive, that they form a citadel rather than a palace. The walls, the pillars, the cisterns, the baths, and the imposing aspect of the whole, have long made this pile be regarded with admiration. The cathedral is a splendid edifice, and contains monuments in memory of Philip I. and his queen Johanna, and of Ferdinand and Isabella; the archbishop's palace is a princely mansion, as well as that occupied by the captain-general of the province. On a hill near the town stands the Generaliffe, another Moorish palace, which displays all the luxury of its founder; the rooms are floored with marble, with rills of water passing through them. The population of the town exceeds 66,000, many of whom are employed in the silk and woollen manufactures, in the tanning of leather, and in the making of saltpetre and gunpowder. The city is the seat of a university, and of a central court of justice.

Malaga, at the mouth of a small river, in a valley surrounded by rugged mountains, is an ancient indifferently built town, with a splendid cathedral. The river is commanded by a Moorish castle, and affords good anchorage; the depth of water is from three to fifteen fathoms. The town is divided into six parishes, and contains 25 convents, nine hospitals, and 42,000 inhabitants. The streets are narrow, the houses are high, and some of the squares are spacious. Wine and raisins are the principal commodities exported.

Antiquera, seven leagues distant from Malaga, is built on small eminences at the extremity of a plain, in long, broad, and handsome streets. It has nearly 20,000 inhabitants, is noted for a medicinal spring, and has on the south a mountainous tract covered with vineyards, which furnish the wine known in England by the name of Mountain.

Ronda, near the south-west border of the province, and 10 leagues from Gibraltar, is environed by steep mountains, and divided into the new and old towns, which communicate by means of a superb stone bridge of a single arch, the top of which is 276 feet above the river, which is seen from that tremendous height through the bars of the projecting iron balconies on each side. The old town is of Moorish construction, with narrow and winding streets; and the new town is regular, and the streets wide and strait, and the squares spacious. Ronda contains 11,000 inhabitants, and its vicinity abounds in fruits, medicinal plants, and iron ore.

Guadix, eight leagues from Granada, on a declivity surrounded by hills broken into masses resembling spires and towers, is a bishop's see, contains five parishes, seven convents, and 8000 inhabitants. This town is noted for the manufacture of pocket knives; and the neighbourhood yields grain, wine, and pastures.

Loxa, on the Xenil, nine leagues from the capital, has three churches, four hospitals, a bridge, the ruins of a castle, and 8000 inhabitants. The other towns are, Santa-Fe, containing 2000 inhabitants; Alhama, a neat town, with 2000 inhabitants also; Marbella, a sea-port, with 3000 inhabitants; and some fishing towns.

GRANADA, New, an extensive viceroyalty of South America, which has for its boundary on the north the Spanish main, on the east the Caraccas and Guiana, on the south the viceroyalty of Buenos Ayres and Peru, and the Pacific ocean on the west, and includes the provinces of Carthagena, Santa Martha, Choco, Darien, and Panama. When this territory was subjected to the Spanish yoke in 1536, it was more populous, and the inhabitants had reached a higher degree of civilization, than any other district in America. The whole amount of the population is now calculated to be less than two millions.

GRANADA, New, a province of Spanish America, included under the viceroyalty of the same name, is bounded on the north and east by the Caraccas and Cumana, and on the south and west by Peru and Popayan; and extends in length, between the 2° and 8° of north latitude, about 300 miles, and is nearly of the same breadth. The great elevation of this territory above the level of the sea, renders the climate very temperate; and the vales and level districts are remarkable for their fertility. The luxuriant forests afford excellent timber of various kinds, and the mountainous regions abound in mines of silver, gold, lead, and copper. The river Magdalena, which traverses the province, discharges its waters into the Atlantic ocean, and is navigable nearly 500 miles from its junction with the sea. The trade and agriculture of the province are not in the most prosperous state, particularly since the commencement of the struggle between the Spanish colonies and the mother country. The manufacture of cotton cloths and of woollen stuffs has been established on a limited scale in some parts of the province; but the chief sources of the wealth of this province are derived from the mines.

Bogota, or Santa Fe de Bogota, is the seat of the government, the see of an archbishop, contains 40,000 inhabitants, and is situated nearly in the 4th degree of north latitude. *Florida* is the principal port for the trade of the inland provinces, is finely situated on the river Magdalena, about 60 miles north-west from Bogota, and numbers about 10,000 inhabitants. *Merida* is built in a valley 20 leagues south from lake Maracaybo, and contains 11,000 inhabitants. Some small settlements are scattered in the province, with numerous Indian villages, and several missionary stations.

GRANDEUR is a term employed to denote certain qualities in an object, of which magnitude is always one; or it is expressive of the agreeable emotion excited by the contemplation of an object, in which such qualities are observed. A neat cottage in a smooth lawn is said to be beautiful, but a magnificent palace or a lofty rugged precipice produces the emotion of grandeur.

GRANGE, Joseph Louis la, one of the first mathematicians of the 18th century, was a native of Turin, and was born in 1736; and although, as it is said, he was at first more devoted to classical learning than to the study of geometry, yet he made such progress, when his mind was thus occupied, that he was found qualified at the early age of sixteen to be professor of mathematics in the royal military school. The enthusiasm for the study with which he inspired his pupils, drew around him those of kindred minds and similar pursuits; and an association was thus formed, and finally gave origin to the academy of Turin.

In the progress of his analytical investigations, La Grange had improved or simplified some of the most difficult problems in mathematical science; and before he had reached his 24th year, his success and celebrity had secured to him the regard and esteem of Euler and d'Alembert; and, in consequence of the high opinion which these illustrious men entertained of his talents and acquirements, he was appointed in 1766 director of the academy of Berlin, for the physico-mathematical sciences; and during his labours in his new situation, he enriched the memoirs of the Berlin academy with much valuable matter.

In 1787, La Grange removed to Paris, was received with esteem and affection by his associates in the academy of Sciences, of which he had been many years a foreign member, was treated with great regard by the court, and had a residence in the Louvre, which he continued to occupy till the period of the revolution. But, previously to this time, his great work, "The Mecanique Analytique," had been dispatched to Paris, for the purpose of publication, although it had not yet appeared. During the eventful period of the revolution, he was nominated one of the commissioners for the formation of a new system of weights and measures. He was afterwards appointed professor in the Normal school, and occupied a conspicuous place in the succeeding establishment of the Polytechnic school, and it was at this time that he composed his "Analytical Functions." Having encountered and escaped the storms of the revolution, he had the good fortune to obtain the favour of Bonaparte, and rose to the most distinguished civil and literary honours. He died in 1813, when he had reached the 77th year of his age.

GRANITE, a compound rock, which consists of feldspar, quartz, and mica, in variable proportions. See Geology.

GRANTHAM, a town of Lincolnshire in England, stands on the river Witham, and consists of four principal streets, lined with many excellent houses. The church is an elegant structure, adorned with painted windows, and much admired for the beauty of its spire. The free school, at which Sir Isaac Newton received the early part of his classical education, is worthy of commemoration. The population exceeds 3000.

GRAPHOMETER, an instrument usually of a semicircular form, and employed for the measurement of angles. See MENSURATION.

GRATIOLA, HEDGE HYSSOP, a genus of plants belonging to the Diandria class.

GRATZ, a town of the duchy of Stiria in Germany, stands on the banks of the river Muehre; is strongly fortified; the streets are spacious, and the suburbs extensive and interspersed with gardens. The mausoleum erected to the memory of Ferdinand II., who was born in 1578, is one of the principal edifices. The population exceeds 30,000; and the surrounding territory is finely diversified with farm houses, cottages, woods, and cultivated fields.

'S GRAVESANDE, WILLIAM JAMES, a natural philosopher, was a native of Bois-le-duc in Holland, and was born in 1688; studied civil law at Leyden, and was afterwards professor of mathematics and astronomy at the same place. He was the author of "An introduction to the Newtonian Philosophy, or a Treatise on the Elements of Physics, confirmed by Experiments," which was long employed as a textbook in this country. He died in 1742.

GRAVESEND, a town of Kent in England, stands on the banks of the Thames, contains more than 3000 inhabitants; and as it is the station for many outward bound ships which are furnished with sea-stores of different kinds, it is often crowded with strangers; and particularly during the bathing season. A manufactory for cables and ropes has been established, and some ship-building is carried on. Garden-stuffs for the supply of the ships are extensively cultivated in the vicinity.

GRAVITATION, or GRAVITY, is that force by which bodies are carried towards the surface of the earth. See ASTRONOMY.

GRAVITY, SPECIFIC, is the weight of a body compared with that of another body of the same bulk, as when a cubic inch of gold is compared with a cubic inch of water, the former of which is found to be nineteen times heavier, and this is denominated its specific gravity.

GRAY, THOMAS, an English poet, was born in London in 1716. Having received the rudiments of his education, he was sent to Eton school, and in 1734 to the university of Cambridge, which he quitted in four years, and entered the Inner Temple; but in a few months after he accompanied Horace Walpole on a tour to the continent. During this tour, unfortunately the two travellers disagreed, parted from each other, and Mr Gray, having completed his travels by himself, returned to England in 1745, and resumed his residence at Cambridge.

He assiduously devoted himself to the exercise of his poetical talents, and drew out many excellent plans for works in poetry, some of which he commenced in an admirable manner, but had not perseverance enough to complete. After he had spent about six years in this retirement, the latter part of which he chiefly employed in close reading, he published his "Ode on a distant prospect of Eton College." In 1751 appeared his "Elegy written in a Country Church-yard," which soon passed through eleven editions, was translated into Latin verse, and became a standard work of English poetry. In 1756 he removed to Pembroke-hall, and two years after, in consequence of the death of Cibber, he was offered the laureateship, which he declined.

As a lyric poet, Gray is known by his odes, "On the Progress of Poesy," and "The Bard," which, in the estimation of some, ranks him among the first English poets. In 1765 he made a tour to Scotland for his health, when he became acquainted with the most distinguished for literature in that kingdom. In 1768 the duke of Grafton conferred upon him the professorship of modern history at Cambridge; but by this time his health was on the decline, which, no doubt, was much accelerated by his low spirits and his anxiety to fill properly his new office, which he saw presented many difficulties, owing to his former indolent habits, and the volatile nature of his literary pursuits; but before he had commenced his academical duties, he was carried off by a fit of the gout in 1771.

Gray is peculiarly distinguished for his skilful selection of the themes best adapted for poetry, and for the rich colouring, loftiness, and energy of his poetical productions. He excelled also in the composition of Latin verse.

GREECE.

GREECE, a country in the east of Europe, is comprehended between the 36th and 41st parallels of north latitude, and surrounded everywhere by the sea, except towards the north, where it is bounded by Macedonia. The whole of this highly celebrated region is naturally divided into three parts; the district north of the great peninsula called the Peloponnesus; the Peloponnesus itself; and several groupes of islands.

Aspect.—The outline of the country is rendered irregular by deep and numerous indentations of the sea, and the interior is rugged with mountainous ranges. Not to mention the lesser bays and firths, or to trouble the reader with a list of ancient names, the gulfs of Contessa, Salonica, Ægina, Napoli, and Lepanto, sufficiently indicate a coast marked by many windings and sharp turns. The highest mountains are situate towards the north, but the whole may be described as a hilly country. Olympus, Ossa, Pindus, Œta, Parnassus, Helicon, Cithæron, and Parnes, are among the most celebrated of these mountains, either for their height, for being associated with religion, or for being the scenes of memorable events. The Achelous, the Eurotas, the Peneus, and the Pamises, are the only streams in the country entitled to the name of rivers. In the interior are several lakes, and numerous fountains; among which, that of Castalia, sacred to the muses, has acquired a far spread celebrity. On the sea-coasts, on the acclivity of the mountains, on the banks of the rivers, and generally throughout the valleys and the plains, are many spots of romantic and picturesque beauty, fertile in useful productions, studded with the abodes and enriched with the labours of men.

States of Greece.—1. *Thessaly*, the most northern district of the country, forms a fertile plain, surrounded by Olympus on the north, Ossa and Pelion on the east, Œta on the south, and Pindus on the west. Between the foot of mount Ossa and the sea lies the famous pass of Thermopylæ, the only entrance in that quarter into the southern provinces from the north. The delightful vale of Tempe is in this district. The country is fertile in corn, cotton, rice, silk, and tobacco. It was anciently the abode of heroes; there the Centaurs and Lapithæ appeared, the Argonauts embarked, Hercules died, Achilles was born, and Pirithous flourished: thence the Achæans, the Ætolians, the Dorians, and other Grecian tribes, derived their origin. It was divided into several districts, and contained many cities.

2. *Bœotia*, a more southern province, was about 50 miles from east to west, and 35 miles from north to south; it was surrounded and traversed by mountains; contained the lake Copias, the reservoir of the river Cephisus, and the forest Cithæron, famous for the fate of Actæon and the revels of Bacchus. The country is adapted for pasture; has excellent harbours, and consequently well situated for commerce. The inhabitants were robust, and fitted for the fatigues of war, but noted for want of genius. Thebes, founded by Cadmus, was the capital, and many other cities adorned the country.

3. *Attica*, south from Bœotia, was of a triangular form, and bounded on two sides by the sea. It was about 60 miles long from north to south, and 35 miles broad from east to west. The surface is diversified by hills and mountains, among which is Hymettus, famous for its honey. It contains quarries of marble, and, anciently, mines of gold and silver. The soil is naturally rocky and barren; but the face of many of the hills is covered with olives and vines. In the 116th olympiad, Attica contained 174 towns, 21,000 citizens and 400,000 slaves. Athens was the capital not only of the district, but, for some time at least, of all Greece.

4. *Megaris*, to the west of Attica, forming a part of the isthmus which separates the rest of Greece from the Peloponnesus, is a rugged and barren territory, of inconsiderable breadth, but fully 30 miles in length. It is traversed by two mountainous ridges, one of which terminates in abrupt and frightful rocks, named Scironides. Megara, the birth-place of Euclid, was the capital city.

5. *Phocis*, bounded on the north by Thessaly and on the south by the Corinthian gulf, was an extensive province of a very irregular form. Parnassus, sacred to the muses, and Helicon, covered with forests, were among the number of its mountains; it was watered by the river Cephisus, and its vallies were beautified with fountains, streams, and cascades, with rich verdure, and delightful flowers. The inhabitants were a brave and warlike race. The most remarkable event in their history was the sacred war, occasioned by their refusal to pay a fine imposed by the Amphictyons, for having cultivated Cyrrha, a territory consecrated to Apollo. The war lasted ten years, and, in the course of it, all the cities were destroyed except Alba, which was spared out of respect to Apollo. Delphi, famed for its temple, oracle, and games, was the most illustrious of its cities.

6. *Locris*, the territory of the Locri-Ozolæ, lay westward from Phocis, on the Corinthian bay; was about 25 miles in length and upwards of 20 miles in breadth. Like the conterminous states, the surface was much diversified, and the soil of various qualities. But, besides this, the Locri had other territories in Greece. The settlements of the Locri-Opuntii were east on the sound between the main-land and the island of Eubœa, to the north of Bœotia; and those of the Locri-Epicnemidii extended thence to the borders of Thessaly.

7. *Doris*, a small district, with Locris on the south and Thessaly on the north, was traversed by lofty mountains, contained some fertile plains, and was watered by the river Pindus. The Dorians gave their name to one of the five orders of architecture, and to an elegant dialect of the Greek tongue admirably adapted to lyric poetry and music.

8. *Ætolia* extended from Thessaly on the north to the shores of the Corinthian gulf on the south, with Locris and Doris on the east, and was also a rugged country. The inhabitants were a turbulent race, who resisted every hostile invasion, till at last they were subdued by the Romans under Fulvius.

9. *Acarnania*, to the west of Ætolia, was of a triangular form, bounded on two sides by the sea. This part of the country is also much diversified by hills and mountains. The river Achelous flows from Pindus along its eastern border into the gulf of Corinth. This division of Greece was once famous for an excellent breed of horses. It contained several cities, among which was Actium; and its inhabitants had constant wars with the Ætolians, till they and their country became a province of Epirus.

10. *Epirus* was an extensive and mountainous territory, bounded on the west by the Ionian sea, and extending from the river Celydmus on the north to the Sinus Ambracius, (now the gulf of Arta) on the south, and eastward to the border of Thessaly. It was divided into a number of petty principalities, and possessed by warlike and turbulent tribes.

Peloponnesus.—Such were the divisions of the northern part of Greece; and the great peninsula, forming the southern part, was divided into six states, namely, Achaia, Elis, Messenia, Laconia, Argolis, and Arcadia.

11. *Achaia* had the Ionian sea on the west and the Corinthian gulf on the north; it extended eastward about 65 miles and southward nearly 30 miles. Its shores are guarded by almost inaccessible rocks, its

interior is mountainous, its soil is poor, and it is watered with a few inconsiderable streams. It contained many cities, among which was Corinth.

12. *Elis* was bounded on the north by Achaia, and on the west by the Ionian sea; was upwards of 60 miles from north to south, and in some places 30 miles from east to west. In the northern part of the province is the mountain Erymanthus, from which the river Peneus descends in a westerly direction to the sea. Elis was anciently divided into three districts. Among the cities of this state was Olympia, at which the Olympian games were celebrated.

13. *Messenia* extended from Elis southward to the sea, and was bounded by Laconia on the east. It is a hilly but fertile region, traversed by the river Pamisus. Messene, built by Epaminondas, was the capital.

14. *Laconia* lay to the east of Messenia, having Sinus-Laconicus on the south, and Sinus-Argolicus on the east. The extent of the province was about 50 miles from north to south, and 40 from east to west. Two ridges of hills ran from north to south along the boundaries; and a shell-fish, from which an excellent purple dye was obtained, was caught on the coast. Sparta was the capital; besides which, there was in the province a great number of cities.

15. *Argolis* lay in the form of a crescent between a gulf of the same name and that of Saron, and was about 75 miles long and 18 broad. It was traversed longitudinally by an irregular ridge of hills, on either side of which were vallies and fertile plains,—the scenes of many memorable events celebrated in the history of Greece. Argos, a very ancient city, was the capital.

16. *Arcadia* occupied the centre of the peninsula. It was anciently divided into the upper and lower districts, both of which were planted with towns and villages. It abounds in mountainous ridges, the principal of which are,—*Cyllene*, where Mercury is supposed to have been born; *Mænalus*, frequented by the nymphs; *Erymanthus*, covered with woods, and famous for the boar slain by Hercules; *Parthenius*, so named from the virgins who used to hunt in the forests; *Lycæus*, where games were celebrated in honour of Pan; *Stymphalus*, at the foot of which is a lake of the same name, where Hercules destroyed the noted birds of prey; and *Parrhasius*, a wooded hill near a town of the same name.

Grecian islands.—The sea-coast of the country already described abounds with numerous islands, many of which are celebrated in ancient history. The greater number of these islands is dispersed throughout the Ægean sea. Of these, Eubœa is the largest, being 150 miles long and 37 broad. The principal town was Chalcis, near to which it was said the island was united to the continent. Chios was next in point of importance; it lies near the coast of Asia Minor, could equip 100 ships, and its chief town, also called Chios, had an excellent harbour capable of containing 80 sail. This island was anciently, and is still celebrated for wine. Lemnos, situate in the north of the Ægæan sea, 112 miles in circumference, was sacred to Vulcan. The Cyclades, a name given to a groupe of about 53 islands, the principal of which are, Ceos, Naxos, Andros, Paros, Milos, Seriphos, Gyaros, and Tenedos. These islands surround that of Delos as with a circle. To the south of the Cyclades lies Crete, one of the largest islands in the Mediterranean sea. It had 100 cities, and was celebrated for the laws which the wisdom of Minos had established. Cythera, off the coast of Laconia, was sacred to Venus. Zacynthus lay off the coast of Elis, and is 60 miles in circumference. Cephalenia, Ithaca, and a number of smaller islands, are situate in the Ionian sea, near the mouth of the Corinthian gulf; and farther to the north, off the coast of Epirus, is Corcyra, famous for the shipwreck of Ulysses and the gardens of Alcinous.

Modern Greece.—Under the Turks, the present masters of the country, Greece, like the rest of their extensive dominions, is divided into pachalics. Livadia corresponds with Greece north of the peninsula, and comprehends the ancient Arcantia, Ætolia, Doris, Locris, Phocis, Attica, and Bœotia. But modern Greece extends northward to the 42d degree of north latitude, and thus includes not only ancient Thessaly, but also the southern parts of Albania and Macedonia. The Peloponnesus is now denominated the Morea, and comprehends the ancient Achaia, Elis, Messenia, Laconia, Argolis, and Arcadia. Most of the islands have changed their names. Eubœa is now called Negropont; Lesbos is now Metilin; Chios has become Scio. Many of the Cyclades have suffered little change. But Creta is now called Candia; Corcyra, in the Ionian sea, is now Corfu; Cephalonia retains the ancient name; but Cythera has been corrupted into Cerigo. The whole is divided into four pachalics, namely, Tripolitza, comprising the whole of the Morea; Eripos, extending over the island of Negropont and part of the mainland; Ioannina, including Thessaly and part of Albania; and Salonica, in which the southern parts of Macedonia are comprehended. The total population of the whole is between three and four millions; of which the half are Greeks, and the rest are Albanians, Turks, and Jews.

Inhabitants.—The people of Greece, and especially the inhabitants of Athens, were distributed into three orders,—citizens, sojourners, and slaves. The citizens surpassed the others in dignity and power. Free-born children were the offspring of free parents; those of half blood, when invested with freedom were always deemed inferior. In early times strangers were admitted on certain conditions to the rank and privileges of citizenship, but in after-times the honour was in general confined to those who obtained possession of it in virtue of their birth-right. Sojourners were entered in a public register, were permitted to dwell in the city in which they had taken up their residence, and allowed to follow their own business without disturbance, but could not be entrusted with any public office, give their votes in the assemblies, or have any share in the government. They were also liable to an annual tribute as a remuneration to the state for the protection it extended towards them. The third and most numerous class of the inhabitants was of two sorts. The first, such who, although free-born, were yet on account of their poverty obliged to serve for wages. Their indigence deprived them of their rights as citizens, but they still retained the power of changing their masters, and wholly to release themselves from servitude when their circumstances improved. The second sort of servants was entirely in the power of their masters, and constituted a part of their property. They performed all the laborious drudgeries of life, had no hope of obtaining liberty, and no power to resist the infliction of punishment or of death. They were not allowed to plead for themselves, nor to be witnesses in any cause. They were accounted unholy and profane, and therefore not suffered to pollute the worship of the gods by their presence. Yet the omnipotence of genius raised favoured individuals of this despised and degraded race to a rank superior to that of their masters. To prove this, we need only mention Æsop the author of the fables, Alcman the poet, and Epictetus the moralist, of whose poverty and servile condition we have mention in this epigram:

> To me great favours the kind gods dispense,
> Though doom'd to bondage and to indigence.

On great emergencies it was customary to arm slaves for the public defence. This required great caution as they were apt to rebel, and became peculiarly formidable when trained and armed. Sometimes they obtained their liberty, and then they always changed their name. The system of retaining the greater proportion of the inhabitants of a country in a state of slavery, prevailed not only in Greece, but throughout the east, till it was abolished by the gentle influence of Christianity.

Manners and customs.—Though the first inhabitants of Greece lived according to the dictates of their inclinations, yet marriage was early reckoned honourable by several of the states, and was consequently much encouraged. The laws of the Lacedemonians, especially, were severe against deferring or abstaining from marriage. Polygamy was not tolerated, but was sometimes practised. Most of the Greeks looked on it as scandalous to contract within certain degrees of consanguinity. Citizens in most of the states were required to match with citizens, the freedom of the cities being regarded as too great a privilege to be granted on easy terms to foreigners. Virgins could not marry without the consent of their parents; and when they had no fathers, the right of disposing of them devolved on their brothers. The most common form of betrothing was for the father of the bride thus to address the bridegroom:—"I "give you this my daughter, to make you father of children lawfully begotten." Minerva, Diana, Venus, and the other divinities superintending marriage, were invoked before the marriage was solemnised; the hair of the parties, and other sacrifices, were also offered to the gods on the occasion. Ceremonies, sacrifices, and entertainments of several days duration preceded, accompanied, or followed the celebration of a Grecian marriage. The Spartan marriages differed from those of the other states. Their courtship was a sort of rape, and their interviews after marriage were conducted by stealth, so that they frequently had children by their wives before they saw their faces by day-light. The Grecian laws of divorce were different. In Crete the fear of too many children was deemed a sufficient reason to dissolve a marriage; in Athens, also, a man could part with his wife on very slight grounds; while in Sparta the practice was somewhat different. It was customary in some parts of Greece to borrow one another's wives; and heiresses might cohabit with their husband's nearest relation when they had no children by him. Adulterers were severely punished, but concubinage was extremely common; and among the cities, Corinth especially was notorious for licentiousness.

The Grecian women were not allowed to appear in strange company, and were confined to the inner apartments of the house. They were so strictly confined in some instances, that they could not pass from one house to another without permission. When they went abroad or appeared in public, they covered their faces with veils; and were attended by matrons or eunuchs. The Lacedemonian virgins had the privilege of going abroad unveiled, with the view, as it is said, of getting husbands for themselves. The most common employments of the women were spinning, weaving, embroidery, and needle-work. Children were carefully brought up, and they returned the obligation in their dutiful regard to their aged parents.

Food and entertainments.—It is said that the people of Argos, in ancient times, fed chiefly on pears, those of Athens on figs, and those of Arcadia on acorns. Ceres at last taught the art of agriculture and the use of corn. The art of making bread is attributed to Pan. Swine were first used as food, of all animals being useless for other purposes. In process of time sheep, goats, oxen, poultry, fish, and game were also devoured. Next to the Lacedemonian tables, those of Athens are said to have been furnished most frugally, the Athenian soil being unfruitful, and such as could not supply more provision than was necessary for the support of the inhabitants. Water and wine, of which they had many sorts, constituted the usual drink of the Greeks. According to some writers, they took four meals a-day, and to others only two. It was customary to bathe and anoint their bodies before an entertainment. The ancient Greeks sat at meat, and three sorts of seats are mentioned by Homer. In later times the custom of reclining on couches was introduced. The guests were ranked according to their quality, the chief persons having the uppermost places assigned them at feasts. Guests were apparelled in white or some other cheerful colour. *Quis unquam coenavit atratus?* "What person was ever found to sup in black?" At every entertainment a part of the provision was offered to the gods; and, for the comfort of the guests,

> Youths well cloaked, well vested; sleek their heads
> And snug their countenances; such alone
> Were their attendants. *Cowper's Homer.*

The Greeks were kind and courteous to strangers, and, along with the ordinary rites of receiving guests, salt was always, in the first instance, placed before them, as an emblem of a constant union of love and friendship. The transgression of the salt and the table, that is, the violation of the laws of hospitality, was accounted one of the blackest crimes. For the funeral rites of the Greeks, the reader is referred to an account of FUNERAL.

Useful arts.—Pasturage and agriculture supplied the Greeks with the articles of food and the materials of clothing. The plough was constructed entirely of wood; shears, as early as the time of Hesiod, were employed to deprive the sheep of their fleece. Barley was the principal produce of the fields, and formed the staple article of food both for men and horses. Before the invention of mills the grain underwent several tedious operations, in order to facilitate the bruising of it between two stones with the hand. The olive was cultivated, but in early times the Greeks were unacquainted with the benefit derived from the oil in dispelling the darkness of night. In Homer's time great fires of wood were used to give light. The vine and various sorts of fruit were cultivated; but the making of wine was a late invention. Of the mechanic arts weaving was best understood, but, contrary to the modern practice, it was performed standing. The hatchet, the wimble, the plane, and the level, are among the tools mentioned by Homer; and perhaps the saw, the square, and the compass, were also in use. In later times the art of cutting marble was carried to great perfection.

Fine arts.--Grecian architecture has not only been approved but imitated by the most civilised nations of modern times. In Homer's time the houses of the great were surrounded by a wall that consisted of two stories, the lower of which was distributed into four apartments, namely, the hall, portico, anti-chamber, and bed-chamber. The roofs were flat, and the doors opened towards the surrounding wall, while the gates of the wall itself opened towards the street. Edifices were usually adorned with pillars of some of the approved orders. The progress of architecture encouraged the growth of the sister art of *sculpture.* In the age of Pisistratus and Pericles this art flourished and was perfected, and among the distinguished names by whom it was cultivated were Phidias and Praxiteles. *Painting* was also carried to a high degree of excellence by Zeuxis, Apelles, and other eminent artists. *Music* was much practised among the early Greeks; and the most wonderful effects are ascribed to its influence. From the time of Thespis, who flourished 536 years before the Christian era, the histrionic art was in much repute in Greece, and consequently improved under the fostering care of premiums and applause. The spirit of emulation was constantly kept alive in the breasts of the Greeks. They lived in the society of their equals, enjoyed common pleasures and amusements, and had daily opportunities of displaying their talents in the presence of their fellow citizens; and hence great genius was seldom permitted to languish in obscurity.

Literature and science.—Prometheus is made to say by Æschylus the poet, "I explained to them the rising of the stars, and the changeable periods of their setting; and I discovered to them a great number of philosophical maxims, and the combination of letters, and memory, the effective source of all arts." Who Prometheus was is unknown, but it is probable he was one of those highly gifted individuals that arise occasionally to enlighten and to bless a portion of the human race. At an early period, Orpheus, by the combined powers of poetry, music, medicine, and philosophy, acquired a commanding influence over the mind of the rude Thracians. But the greater part of the learning and religion of Greece was imported from Egypt. Homer, who was born at least a thousand years before the Christian era, is still regarded not only as the most ancient, but also as the greatest of poets. The Iliad and Odyssey have remained and will remain the imperishable monuments of his sublime genius. Hesiod, supposed to have been the contemporary of Homer, was a native of Bœotia, and has also obtained a lasting reputation for his poems, entitled, *Works and Days*, and *Theogony.* Apollonius, who wrote a poem on the expedition of the Argonauts, was born 230 years before Christ; and among the lyric poets are the well known names of Anacreon, Sappho, and Pindar. The songs in honour of Bacchus, sung during the time of vintage, are said to have given rise to tragedy. The word signifies the song rewarded with a goat; and it was improved and perfected by Thespis, Æschylus, Sophocles, and Euripides. In comedy, the other species of drama, (which took its origin from the strains of raillery and humour practised by the people assembled at the village festivals of Attica,) the name of Aristophanes stands pre-eminent. His Clouds, in which Socrates is ridiculed, is still popular in our schools. He wrote more than sixty pieces, of which eleven only have reached our times. Pastoral poetry was cultivated by Theocritus and others. Pericles, Æschines, and, above all, Demosthenes, stand unrivalled as orators. Herodotus, who flourished 500 years before the Christian era, is the father of history. His writings contain an account of the Medes, Persians Phœnicians, Lydians, Greeks, Egyptians, and Scythians; and indeed it embraces the annals of nearly the whole known world, digested into regular order, under particular countries. Herodotus excels in clear, distinct, and unaffected narration; and his works will be read as long as literature is cultivated. Thucydides the historian of the Peloponnesian war; Xenophon, who wrote an account of the education of Cyrus, and of the "Retreat of the ten thousand;" and Polybius, the author of an elaborate history of the Roman empire, from the second punic war to the conquest of Macedon, are all justly celebrated in this department of literature.

The philosophers of Greece were divided into numerous sects or schools. A set of men, named *Rhapsodists*, in early times frequented festivals, and recited and explained the poems of Homer and Hesiod. Some of these men founded schools and were called *Sophists*, or teachers of wisdom, by their admiring pupils. Thales, celebrated for his knowledge of geometry and astronomy, founded the Ionic school of philosophy 640 years before Christ. His ethical doctrines were pure and rational; he taught the belief of a first cause and an over-ruling providence, but supposed the universe to be animated by the divinity, as the soul does the body. Pythagoras, who derived his knowledge from Egypt, founded the Italian sect. He taught the transmigration of souls through different bodies, and hence prohibited the use of animal food. He had just notions of the rotundity of the earth and the system of the planets. The Eleatic sect was founded by Xenophanes about 500 years before Christ, and was supported by Zeno and others. They maintained that things had neither beginning nor end, nor change, all apparent changes being mere deceptions of the senses. The Socratic school arose from the Ionic. Socrates, the founder, was the wisest of all the Greeks. He exploded the futile logic of the sophists, which was applied with equal plausibility to maintain either truth or falsehood. His mode of reasoning was to bring his antagonist to particulars, by making him concede some simple and undeniable position; and to conduct him to truth by a series of concessions. He taught the belief of a first cause, the moral agency of man, the immortality of the soul, and a future state of rewards and punishments. The morality of Socrates was successfully cultivated by the *Cyrenaic* school, but was pushed to extravagance by the Cynics. Virtue, they maintained, consisted in renouncing the conveniencies of life. They condemned knowledge as useless, indulged themselves in scurrility and invective, clothed themselves in rags, eat and slept in the streets, or wandered through the country with a staff and a knapsack. Plato founded the Academic sect. He entertained sublime ideas concerning the attributes of deity. Aristotle, the tutor of Alexander the Great, was the father of the Peripatetic sect, and established his school in the Lyceum at Athens. Aristotle seems to have possessed the most philosophic and comprehensive mind of all the ancients, and his authority maintained a powerful influence in the schools of modern times, till a very recent period. The sceptical school was founded by Pyrrho, who, with his disciples, inculcated universal doubt as the only true wisdom, and sought tranquillity of mind as the greatest happiness, by holding all opinions in absolute contempt. The Stoics again, who also were of opinion that happiness consisted in tranquillity of mind, sought to attain it by endeavouring to raise themselves above all the passions and feelings of humanity. The Epicureans, on the other hand, maintained that man's supreme happiness was to be found in pleasure—a tenet which, whatever were the views or the conduct of Epicurus himself, led to unbounded licentiousness. The great error of all the Grecian philosophers was, their construction of theories without facts obtained from experiment and observation; and hence they were very unsuccessful in advancing the interests of true knowledge.

Government and laws.—The different states of Greece had their respective systems of government and codes of laws; and had frequent struggles with each other in defence of their independence. In early times the monarchical form of government seems to have been most common. But this was neither settled nor permanent: revolution succeeded revolution; and the states experienced oligarchy, aristocracy, and democracy in their turns. And though each of the states had a species of independence within itself, yet some one or other of them, having obtained superior power, exerted a political influence over the councils of its weaker neighbours. They were also associated together by a kind of federal union, at the head of which was the Amphictyonic council.

Amphictyonic council.--This celebrated council was composed of twelve of the wisest men of Greece sent to represent their respective states, namely the Ionians, the Dorians, the Perhoebians, the Boeotians, Magnesians, the Phthians, the Locrians, the Malians, the Phocians, the Thessalians, the Dolopes, and the people of Œta. The number was from time to time increased by other cities sending their representatives as members of the council, so that in later times it was composed of thirty members. They generally met twice a year at Delphi, and sometimes at Thermopylae. Before they proceeded to business, they sacrificed an ox to the god of Delphi, and cut his flesh in pieces, to intimate that union of design and operation prevailed in the several cities which they represented. They took into consideration all matters of difference that might exist between the different states of Greece. Their decisions were held sacred and inviolate, and arms were sometimes taken up to enforce them. Of this, the Phocian war is a striking example. The Phocians had been guilty of sacrilege, and the Amphictyons declared war against them, which lasted ten years, and involved the whole of Greece in the contest.

The republic of Sparta.—One of the most extraordinary forms of government, either of ancient or modern times, is that which prevailed in Sparta. After the return of the Heraclidae, this city with its territory was divided between two brothers, and this double monarchy continued in two separate branches for almost 900 years. But the want of constitutional laws was severely felt, till Lycurgus, brother of one of the kings, undertook, with the sanction of the sovereigns and the people, to remodel the constitution of his country. His abilities and wisdom pointed him out as the fittest person for this important task; and he began his labours by instituting an elective senate of twenty-eight members, whose office was to preserve a just balance between the kings and the people. All state affairs passed this body before receiving the sanction of the people, without which it was ineffectual. The kings presided in the senate, and were the generals of the army. Lycurgus deemed luxury the bane of society, and set himself against it in all his enactments. The territory was divided into equal portions among the free citizens; iron money was substituted for gold and silver; commerce was abolished, and no arts but those necessary to life were allowed. The whole citizens made their principal repast at public tables, and were allowed only a coarse and parsimonious meal. The education bestowed on youth was intended to cherish only the severer virtues. The duties of religion, obedience to the laws, respect for parents, reverence for old age, honour, courage, contempt of death, above all, the love of glory and of their country, were the principal things which it comprehended. Yet little regard was had to public decency. Theft was part of a liberal education. Slaves were treated with barbarous rigour; and the office of ephori,—magistrates elected by the people,—though subordinate in respect of power, had, in some things, an authority paramount to that of the kings and the senate.

The republic of Athens.—Attica, like the other divisions of Greece, was governed by kings for a long series of years; and, on the abolition of the regal office, by a chief magistrate, named the archon or head. But as the archonship was, during three centuries, a perpetual and hereditary authority, the change of the constitution was more nominal than real. Afterwards it was agreed, that the office of archon should continue in the same person no longer than ten years; then the number was increased to nine, with equal authority, and the election made annual. It is easy to conceive that, during this state of things, factions must have existed, and were exasperated to violence. At length Solon, an illustrious Athenian, of the race of Codrus, attained the dignity of archon, 594 years before the Christian era, and was entrusted with the care of framing for his country a new form of government, and a new system of laws. But though he had great knowledge, he wanted intrepidity of mind; and therefore he sought rather to accommodate his system to the prevailing habits and passions of his countrymen, than to subdue them by training them to virtue by the obedience of good laws. The people claimed the sovereign power, and received it; the rich demanded offices and dignities, and were accommodated to the utmost of their wishes. Solon divided the citizens into four classes, according to the measure of their wealth. To the first three, the richer citizens, belonged all offices of the commonwealth. The fourth, the poorer class, more numerous than all the other three, had an equal right of suffrage with them in the public assembly, where all laws were framed and measures decreed. To regulate, in some degree, the proceedings of the popular assembly, Solon instituted a senate of 400 members, afterwards enlarged to 600, with which every measure originated before it became the subject of public discussion. A tribunal, called from Areopagus (Mars-hill), an eminence near Athens, the Areopagitæ, guarded the laws, and possessed the power of enforcing them. To this court belonged the supreme administration of justice, the custody of the treasures of the state, the care of religion, and a tutorial power over the youth of the republic. The number of its judges varied at different periods, and the most immaculate purity of character was essential to that high office. Yet faction always reigned in Athens, and she often saw her best patriots, the wisest and most virtuous of her citizens, sacrificed to the revengeful passions of the ruling party. The Athenian laws relating to debtors and slaves were mild and equitable; but women were kept in a state approaching to complete vassalage. He who introduced a new law, found on experience to be impolitic, was liable to punishment.

Ostracism, a ballot of all the citizens, in which each wrote down the name of the person in his opinion most obnoxious to censure, was the most absurd and iniquitous peculiarity of the Athenian and some other governments of Greece. He who was thus marked out by the greatest number of voices, though unimpeached of any crime, was banished for ten years from his country. This barbarous and disgraceful institution was rendered subservient to the worst of purposes, and has stained the character of Greece with many instances of public ingratitude. It will be evident, from this sketch of the public institutions of Sparta and Athens, that the character of these two cities exhibits a complete contrast to each other. The citizens of Sparta were rude, those of Athens were polished; the former despised arts and all by whom they were cultivated, the latter carried them to a higher pitch of perfection than they had before or have since attained; an austere frugality characterised the Spartans, and a refined luxury distinguished the Athenians. Yet they were equally ambitious and brave, and possessed by turns a leading influence over the inferior states. But the institutions, the manners, and the customs of Athens, and not those of Sparta, were imitated by the rest of the Greeks.

Religion.—The superstitious notions and practices prevalent in Greece were derived partly from Egypt and partly from Thrace. In Hesiod's time it was the general belief that 30,000 gods, subjects of Jupiter and guardians of men, inhabited the earth. Temples were built, and adorned with the greatest splendour and magnificence, because it was supposed to be acceptable to the gods, and fitted to inspire the people with reverence. The Lacedæmonians alone served the gods with the greatest economy; for in some instances the same temple was dedicated to several gods. Different gods, too, had temples built to them of a peculiar form, because supposed more acceptable to them than any other. Thus the Doric pillars were sacred to Jupiter, Mars, and Hercules; the Ionic to Bacchus, Apollo, and Diana; and the Corinthian to Vesta the virgin. Temples were placed on mountains, in valleys, or by rivers and fountains; were surrounded with trees, and divided into two parts—the sacred and the profane. In the temple were placed the idols, or visible representations of the deity to whom it was dedicated, together with all things necessary for the worship. The place of the images was in the middle of the temple, where they stood on pedestals raised above the height of the altar. The altars were constructed of earth, ashes, or stone. The order of priests and priestesses was numerous. It was necessary that every one on entering into this office should be sound both in body and mind. The priests had many duties to perform, such as offering the sacrifice, keeping the temple, guarding the sacred revenue, and many others. Among the sacrifices were *free-will offerings*, as grateful acknowledgments to the gods for their goodness; *propitiatory offerings* to avert the anger of some offended deity; and *petitionary offerings* for success in any enterprise.

In former times the gods were cheaply pleased, but afterwards their oblations became very burdensome from their number and value. The rich fumes of incense, libations of wine, milk, oil, or honey; salt and cakes of different kinds; and victims of sheep, oxen, fowls, and other animals, constituted the usual sacrifices. And, to crown the whole, it was customary on some occasions to offer up human victims. Men of wealth sought to ingratiate themselves with the gods by the magnificence of their

Greece.

offerings. They offered a *hecatomb*, which consisted of a hundred living creatures, generally oxen, or a sacrifice, which consisted of a thousand. Besides their sacrifices, the Greeks addressed their gods in prayers, supplications, and imprecations; and they also swore by their name in confirmation of the testimony they had occasion to give in any matter of importance.

The gods of the Greeks.—The objects to whom these sacrifices were offered were too manifold, as well as various, to admit of any useful enumeration. They were divided into celestial, terrestrial, marine, and infernal deities; besides a vast number and variety of demi-gods, deified men, and deified virtues and vices. The celestial gods were, Jupiter, supreme over gods and men; Apollo, the god of wisdom; Mars, the god of war; Mercury, the god of merchants, orators, and thieves; and Bacchus, the god of wine. The celestial goddesses were, Juno, the wife of Jupiter; Minerva, the goddess of wisdom; Venus, the goddess of love; Diana or Luna; and Bellona. The terrestrial deities were Saturn, Vulcan, and many others; and the goddesses were Vesta, Ceres, the nine Muses, and many more. The marine or sea gods were Neptune, Triton, with a variety of male and female monsters. Pluto was the supreme deity of the infernal regions, to which the Fates, the Furies, Night, Death, and Sleep belonged. The rural divinities were also numerous, as well as household gods, and gods presiding over cities and individuals. Illustrious men were enrolled among the gods, as well as virtues and vices, such as honour, justice, and envy, discord, and calumny.

Oracles and divination.---Some of the gods were believed to make known the secrets of futurity at chosen places, in a particular manner, and to favoured individuals. And as the future exerts a strong influence in exciting the hopes and fears of mankind, the consultation of oracles formed a conspicuous part of the religion of Greece. At Dodona, a town in Thessaly, according to some authors, and in Epirus according to others, was an oracle of Jupiter, on a small hill named Tmarus. At first the response was given by the murmuring of a fountain; but afterwards kettles were suspended in a peculiar manner near a brazen statue which held a lash in its hand. When the wind blew strong the statue was agitated and struck against one of the kettles, which communicated the motion to the rest, so that a clattering noise was raised, and thence the priests drew their predictions. The oaks of the forest of Dodona were supposed to possess the power of emitting oracles. In the same forest was a fountain of cool water, which lighted a torch the moment it was brought into contact. This fountain ebbed and flowed every 24 hours; and, from these circumstances, now known to be nothing extraordinary, it was accounted sacred. The oracles of Dodona were originally delivered by men and afterwards by women. The oracle of Apollo at Delphi was still more celebrated than that of Jupiter at Dodona. This oracle is said to have been discovered by a goat-herd. His goats were observed by him to become frantic when they approached a hole in the earth whence a steam issued. He had the curiosity to try the experiment upon himself, and having imbibed a portion of the steam, was instantly seized with a fit of enthusiasm, and uttered extravagant expressions, which passed for prophecies. The place was revered as holy; a temple to Apollo was erected on it; the Pythia, or priestess appointed to receive the inspiration by sitting on a tripod or three-footed stool placed over the aperture whence the vapour issued; and then, when convulsed by its influence, to deliver the oracle of the god to the anxious inquirer in ambiguous verse. The Pythia was at first a young virgin, but was afterwards bestowed on women of advanced age only. There was originally but one Pythia, in later times two, and sometimes more were appointed; and a number of subordinate priests also belonged to the institution. The Pythia was consulted only in one of ths spring months of the year, and those who came for information from the oracle came laden with rich presents to Apollo; and thence arose the opulence, splendour, and magnificence of the temple of Delphi. When the omens were unfavourable, the priestess refused to give any response. Apollo had also an oracle in the island of Delos, at Claros in Ionia, at Eutrepis in Bœotia, and at several other places. Besides, there was a considerable number of other oracles in Greece, but of inferior note. Divination by dreams, sacrifices, birds, lots, and ominous words and things, was in like manner extremely common.

Festivals.—Connected with religion, or rather forming a part of it, were numerous festivals instituted in honour of the gods, in memory of deceased friends, as seasons of ease and relaxation, or with the view of obtaining special favours from heaven. As the Athenians exceeded the rest of Greece in the number of their gods, so also they were distinguished by the number and splendour of their festivals; and in those sacred to Bacchus and Venus, every species of extravagance was practised.

Games.—Four different sorts of public games were celebrated in Greece, accounted sacred because they were instituted in honour of the gods, were commenced and concluded with solemn sacrifices, and held in the greatest estimation far beyond the boundaries of Greece. The most celebrated of the whole were those which bore the name of the Olympian games, a name derived from Olympian Jupiter, to whom they were dedicated. They are supposed to have been instituted by Hercules 1222 years before the Christian era; fell afterwards into disuse; and were revived 884 years before Christ, a period which forms a celebrated epoch in the history of Greece. They were observed every fifth year, under the superintendence of the people of Elis, till after the destruction of Pisa, when they were entrusted to the Pisæans. The presidents varied in number at different times from 1 to 12. They swore to act impartially; they usually sat naked, and held before them the crown prepared for the conqueror. Running, leaping, wrestling, boxing, and throwing the quoit, were exhibited at these games; as well as horse and chariot races, and competitions in poetry and the arts. The combatants engaged naked, no regard being paid to decency. The victor was rewarded with an olive crown, and a great deal of honour. No woman was permitted to be present at these games, and no person of bad character allowed to enter the lists. They were attended by vast multitudes of people, not only from every part of Greece, but also from the neighbouring countries.

The Pythian games were celebrated near Delphi, in commemoration of the victory which Apollo obtained over the serpent Python. At first they were performed only once in nine years; then after a revolution of five years, or the second year of every olympiad. At these games the gods themselves are said to have been combatants. Castor gained the horse-race, Pollux obtained the victory in boxing, Calais at running, Zethes at fighting in armour, and were rewarded by Apollo himself with a laurel crown. Songs were sung, which were called the *Pythian modes:* they were divided into five parts, and represented the fight and victory of Apollo over the Serpent. A dance was also introduced; and in the 48th olympiad, the Amphictyons, who presided over the games, increased the number of the musical instruments by the addition of the flute; but as this instrument was used in funeral lamentations, the association made it unfit for merriment, and it was therefore soon laid aside. The Roman *ludi Apollinares* were borrowed from the Pythian games.

The Nemean games were celebrated every third year at Nemea, a village between the cities of Cleonæ and Phthius. The presidents were chosen out of Corinth, Argos, and Cleonæ, and clothed in black, because these games were a funeral solemnity in memory of Opheltes, whose death was foretold by Amphiaraus, as soon as he began to live,—a circumstance which was regarded as the prelude of all the bad success that befel the Theban champions.—Others are of opinion that the games were instituted by Hercules after his victory over the Nemean lion. In the exercise of chariot-races and other sports, the victors were crowned with parsley, which was an herb used at funerals, and feigned to have sprung out of the blood of Opheltes, otherwise called Archemorus, a name derived from the prediction respecting his death.

The Isthmian games were so called from the Corinthian isthmus, where they were celebrated. They were instituted in honour of Palæmon, or Melicertes, and his mother Ino. This lady, urged by fear of her husband Athamas, king of Thebes, who, in a fit of madness had killed his own son Learchus, threw herself, with Palæmon in her arms, into the sea, and was there received by Neptune, and admitted among the number of his train, out of compliment to Bacchus, who had been nursed by Ino. Some are of opinion, that the games were instituted by Theseus in honour of Neptune. They were observed every third or every fifth year, and held extremely sacred and inviolable. The victors were rewarded with garlands of vine leaves, and afterwards with dry and withered parsley.

Military affairs.—The history of Greece is calculated to inspire every reader with a high idea of the skill of the generals and the prowess of the people. The armies for the most part were composed of free citizens, whom the laws obliged at a certain age to appear in arms upon the summons of the magistrate. The military age extended from the 18th to the 60th year, and soldiers when on actual service maintained themselves at their own expence. The Carians were the first of the Greeks that received pay, and thus made their name infamous to posterity. But in the age of Pericles military pay had become general. The main body of an army consisted of infantry, the rest was composed of cavalry, chariots, and elephants. The armour employed was very different at different times: but helmets, breast-plates, and shields were always common. Stones, clubs, spears, bows and arrows, slings, swords, and fire-balls, were the principal of their offensive arms. Lacedæmonian soldiers were clothed in scarlet, and never engaged with their enemies except with crowns and garlands upon their heads. In ancient times kings always commanded their own armies; but when democracy was established in the states, generals were appointed in an assembly of the people. Before the Greeks engaged in war, they published a declaration of their grievances, and sent ambassadors to demand satisfaction, which, if not granted, was sought by arms. But previous to this, a herald was sent to bid the offending party prepare for invasion. Their mode of encampment is not well known, and depended much upon the character of their generals. The general harangued his men before an engagement; sacrifices were also offered to Mars and some other divinities. Trumpets and other instruments of noise were sounded both to engage and to retreat. Trophies were erected where a victory had been gained, and it was unlawful to demolish them, as they were regarded sacred by being dedicated to some god.

Naval affairs.—The situation of Greece rendered it necessary for the inhabitants, of particular parts of it especially, to entrust themselves to the stormy waves. This necessity led to the study of maritime affairs, and to consequent inventions in the art of navigation. Ships at first were very rudely constructed, such as Charon's boat is described by Virgil to have been:

> The feeble vessel groans beneath the load,
> And drinks at many a leak th' infernal flood.

When they attained to some degree of perfection, and were furnished with sails, they were supposed by the ignorant to be endowed with animation; and gave rise to many fables of dragons, griffins, and winged horses. The beaks of ships of war were fortified with brass, and had a helmet engraved on the top of their masts. The crew consisted of rowers and mariners, and a peculiar kind of soldiers that always served at sea. The Athenians far excelled the other Greeks in their skill in naval affairs, and on that account had a great deal of power by sea. Athens, Corinth, Cos, and some other maritime states, had vessels for commerce as well as for war; but traffic of all kinds was of little estimation in Greece, and consequently never flourished, though it is impossible to imagine a country better calculated for that species of industry.

Antiquities.—Greece at the present day exhibits a very different appearance to the traveller from what she must have done in ancient times, when she inspired her authors with so many eloquent descriptions of the fertility of her soil, the magnificence of her cities, as well as of the lofty character of her people. The ruins of Athens still bear witness of her ancient greatness, and enable him who contemplates them to form some idea of what it must have been in the days of Pericles, when it was extended and beautified by the genius of artists greater than the world had hitherto, or has since witnessed. The Parthenon which crowned the Acropolis, with all the variety of mouldering temples at Athens, the ruins also which strew the respective sites of Corinth, Sparta, Mycenæ, Nemea, and many other cities renowned in history, are abundant proofs of the perfection which architecture had attained in Greece in ancient times.

Historical summary.—The civil history of this celebrated country, inclusive of that part of it which is unsupported by authentic documents, commences nearly 2000 years before the Christian era; and, descending from that remote period to the present time, comprehends as many revolutionary changes, and splendid events, as are elsewhere to be found recorded in the annals of the human race. These events, as we proceed in the historical sketch, shall be pointed out to the reader's attention.

Original inhabitants.—Greece, above 1800 years before Christ, is said to have been inhabited by many small tribes of hunters and fishers, distinguished by the names of the Pelasgi, the Hellenes, the Dorians, the Etolians, and the Ionians. These were rude and erratic families of the same race who by degrees extended themselves throughout the islands of the Archipelago, the mountains of Thrace, and the shores of Italy. The Titans, an Egyptian or Phœnician colony, who settled in the country as early as the time of Moses, first introduced civilization and religion. Inachus, the last of this race, founded the kingdom of Argos in the time of Abraham. Cecrops, the leader of another colony from Egypt, landed in Attica, became sovereign, and established the court of the Areopagus. Cecrops was succeeded by Cranaus, in whose reign occurred the deluge of Deucalion, so much magnified and disguised by the poets. Amphictyon, the contemporary of Cranaus, founded the Amphictyonic council, which from a league of 12 cities, became afterwards a representative assembly of the states of Greece, and had the most admirable political effects in uniting the nation, and giving it a common interest. Cadmus, about the year 1519 before Christ, introduced alphabetic writing into Greece, from Phœnicia. The alphabet then had only 16 letters; and the mode of writing was alternately from left to right, and right to left. From this period the Greeks made rapid advances in civilization.

The Argonautic expedition.—Several causes combined their influence in effecting the civilization of Greece; and, among these, the mysteries, oracles, and festivals of religion; the celebration of the Olympic, Pythian, Nemean, and Isthmian games; and the daring spirit of naval enterprise, supposed to have been imbibed from the commercial Phœnicians, may be regarded as the chief. A fleet, in which was the celebrated ship Argo, was equipped to explore the coasts of the Euxine, with the view of making discoveries, obtaining riches, planting colonies, and avenging injuries. Jason, a renowned hero, had the command of the fleet, and Chiron, the astronomer, directed the plan of the voyage. The intended expedition was published throughout Greece, and the young, the brave, and the ambitious, assembled to share with Jason its toils, its gains, and its glory. To carry off the golden fleece is represented in poetry as the object of the adventurers,—a fable founded on the fact of the people on the eastern shores of the Euxine having been in the habit of extending the fleeces of their sheep to intercept the particles of gold carried from mount Caucasus by the torrents. The real intention of the Argonauts is, however, best ascertained by its consequences. The inhabitants of Colchis were plundered, a Grecian colony planted in their land, and the daughter of their king, the celebrated Medea, carried into Greece.

Heroic age.—The success of the Argonauts roused the ambition, and consequently the activity and the emulation of their countrymen. A race of heroes arose, among whom Hercules, Theseus, Castor and Pollux, were illustrious. Many petty wars were kindled, and prosecuted with much effusion of blood and waste of treasure, between the rival tribes; but of these intestine animosities, the struggle with Thebes is the most memorable. The sons of the unfortunate Œdipus, having hastened their father's death, agreed to sway the Theban sceptre by turns. The elder brother soon usurped his brother's right, and reigned alone, till the king of Argos, espousing the cause of the younger brother, who had married his daughter, enabled him to assert, by force of arms, his right to alternate sovereignty. But long before the war was brought to a close, both the unhappy kings fell the victims of the sword which their ambition had caused to be unsheathed.

The institutions of Crete imported to Attica.—The necessity imposed on the Grecian chiefs of combining their strength against the designs of foreign foes, at length suggested to them the advantages of a bond of union, and of conducting themselves towards each other with justice and humanity. The example of the people of Crete, a Dorian colony, appeared worthy of their imitation. They had continued free from civil broils, and had learned laws and civilization from Egypt. Rhadamanthus and Minos, with some of their other early rulers, had contributed to bring about this desireable state of things; and Theseus, son of the king of Athens, aware of the improvement, and desirous to benefit by it, visited the island and studied its political institutions, which he afterwards introduced into Attica; and from thence they were diffused throughout Greece, and a uniform system of government was established.

Trojan war, before Christ 1193.—This federal alliance rendered the Grecian states formidable to the enemies of their country, and ready to resent and chastise the affronts or injuries which any of its members might sustain; and soon after its formation a memorable opportunity occurred for proving the omnipotence of unity of purpose and combination of effort.

Greece.

An hereditary feud had subsisted long between the ancestors of Priam, the king of Troy, and those of Agamemnon the king of Mycenæ and Argos. This was blown into tenfold fury by Paris, one of Priam's sons, having seduced, and carried to Troy, Helen, the beautiful wife of Menelaus, brother of Agamemnon. The injured husband and his brother instantly appealed to the confederated states; and their indignant chiefs promptly assembled with all their force at the summons, when it was resolved not only to rescue the captive Helen, but to pursue and punish her ravisher, together with his race. The army destined for this expedition assembled at Aulis, a seaport of Bœotia, and the fleet for transporting it to Asia amounted, it is said, to 1200 sail. To oppose this mighty host, Priam collected auxiliary troops from many parts of Asia Minor, such as the Carians and the Lycians, which were headed by skilful and gallant generals; so that the city of Troy sustained a siege for ten years, and was at last taken by stratagem.

Subsequent state of Greece.—After her triumph over Troy, Greece was involved in a variety of calamities. The people, during the absence of their rulers, had become disorderly and seditious; jealousies had been excited in the breasts of many of the leaders, which, on their return, produced intestine discord; some of the states were impoverished by the war; and many of the chiefs had either fallen during its progress, or were cut off by the hand of assassins, or were tossed on the ocean, the sport of the waves. A long and gloomy period ensued, the obscurity of which research has not been able to penetrate. A passion for emigration, excited, perhaps, by domestic dissension, the uncertain tenure of landed property, and the superabundance of population, seems to have had an extensive influence after the Trojan war. Many of the northern inhabitants left the seats of their ancestors to seek an asylum in more distant parts of the country. At a former period the family of Pelops had expelled that of Hercules from the Peloponnesus; the exiled Heraclidæ had found a refuge in Doris, and Hyllus their leader having been adopted by Epalius, the Dorian king, they became masters of that mountainous region on the death of that aged monarch. But dissatisfied with the wilds of Œta and Parnassus, they longed to recover their ancient possessions in the peninsula, collected their strength for that expedition, crossed the gulph of Corinth, landed on the Pelopennesian coast without opposition, and were soon in possession of all the maritime provinces. Numerous wars, with a long train of changes and calamities resulted from this irruption. The fugitives from the peninsula sought and found an asylum in Attica, and the circumstances of their expulsion served to inflame the jealousy which was already kindled between the Doric and Ionic race. The Dorians made inroads on the Athenian frontier in the reign of Codrus; and a superstitious opinion having gained a general currency, that the Dorians should finally conquer the Ionians, provided they abstained from injuring the person of an Athenian king, that heroic prince resolved to sacrifice his life for the honour and independence of his race. With that design he disguised himself in the habit of a peasant, proceeded to the enemies camp, insulted a Dorian soldier, a combat ensued, Codrus fell, and his body was no sooner recognised than the enemy, despairing of success, suspended their hostilities. After this event the regal authority was abolished at Athens. No prince was deemed worthy to succeed the patriotic Codrus; the people declared that henceforth none but Jupiter should reign in Athens, and, in pursuance of that resolution, Medon, the eldest son of the deceased king, was appointed chief magistrate, with the humble title of archon. His two brothers conducted a migration of Ionians to Asia Minor, and seized upon the central part of the coast of that country, and afterwards diffused themselves over a wide extent of its interior. Africa also, and the islands of Sicily, Sardinia, and Cyprus were colonized from Greece. Other colonies found settlements on the shores of the Propontis and the Euxine. The Dorians were afterwards finally expelled from many of their strongholds in Megara, and emigrated in numerous bands from their native country. And thus 200 years after the Trojan war the Greeks had extended themselves over a large portion of Europe, Asia, and Africa; and though they were distributed into a great number of distinct and independent communities, they regarded themselves as of the same origin, ramified into four separate races, namely, the Ionic, the Doric, the Eolic, and the Attic, who all spoke the same language with some peculiarities of dialect. The example of Athens was soon followed through all the states of Greece, and the name of king completely abolished.

War between Greece and Persia.—Three monarchies —Nineveh, Babylon, and Media,—arose on the ruins of the first Assyrian empire, which ended under Sardanapalus. Dejoces united the independent tribes of the Medes under his monarchical subjection: his son conquered Persia, which Cyrus united to the kingdom of the Medes, and vanquished the Babylonians and Lydians, and subjected the greater part of Asia Minor, as well as Syria and Arabia. His son Cambyses was a madman, and a tyrant; and as he possessed great resources he was enabled to do a great deal of mischief. Darius Hystaspes was elected sovereign of Persia after the death of Cambyses. He was a prince of great enterprise and ambition; but was unfortunate in an expedition against the Scythians. He afterwards achieved the conquest of India, and then meditated an invasion of Greece. The Athenians had assisted the people of Ionia in an attempt to throw off the Persian yoke, and Darius having reduced the Ionians to submission, turned his arms against their Grecian allies, and was prompted to undertake the restoration of Hippias, an Athenian exile.

Conduct of the Greeks.—To the insolent demand of earth and water, in token of their submission to their invader, the Greeks answered by taking up arms, and putting themselves in a posture of defence. The different states were at this period happily united together in the firmest bonds of alliance, so as to make their combined strength bear upon the foreign foe, the very name of which was odious to every lover of his country. The first Persian fleet was wrecked off the promontory of Athos; but a second ravaged the Grecian islands, and a third landed an immense army in Eubœa, which poured down with impetuosity on Attica.

Battle of Marathon, before Christ 490.—In this emergency Athens sent for assistance to Sparta; but though that city was willing to lend its aid in repelling the invaders, superstition prevented its troops from taking the field till the full moon. A dread of the Persian power deterred the other states from affording succours to the apparently devoted people of Attica. The inhabitants of Platea alone furnished them with 1000 men, and they were left to find all other assistance in their courage and despair. They went forth to oppose the mighty host which had come against them with an army of 10,000 men under the command of ten generals, each of whom was to have the chief command in succession during the short space of a single day. It was determined in a council of war not to wait for the approach of the enemy to the walls of the city, but to go and meet him in the open plain; and Aristides, one of the generals, aware of the evil consequences likely to ensue from an authority which changed every day, resigned his turn to command to Miltiades as the more able and experienced general,—an example which all the other commanders fortunately imitated. Miltiades, thus invested with supreme authority, drew up his little but determined army at the foot of a mountain, so as to prevent the enemy from surrounding him or charging him in the rear; his flanks he fortified with large trees cut and piled for the purpose, and they served to defend his men from the charge of the enemy's cavalry. Datis, the Persian general, with an army of 100,000 foot and 10,000 horse determined on an immediate engagement. When the signal was given, the Athenians, rendered reckless from despair, rushed with headlong impetuosity upon the ranks of the Persians. This was an uncommon and an unexpected mode of attack, but the Persians stood their ground, and a long, fierce, and obstinate battle was the result. The main body of the Athenian army oppressed with numbers was beginning to give way, when victory crowned the gallant exertions of its wings. This success inspired the whole army with new ardour; the Persians began to give way; were soon thrown into universal confusion; and fled with the utmost precipitation to their ships. The victors pursued them to the shore, and set many of the ships on fire. In consequence of this, besides 6000 who were left dead on the field of battle, multitudes of the panic struck Persians were drowned in the sea or consumed by the flames. The Greeks had 200 killed, among whom was Callimachus, who had given his vote for risking the engagement. Hippias, also, whose ambition had prompted the war, is supposed to have lost his life in this memorable action. Eucles, an Athenian soldier, left the field to carry the tidings of victory to Athens, and when he reached the door of the first house, he fell exhausted, uttering these words, *Rejoice, we triumph*! and instantly expired. The rich spoil was guarded by Aristides and divided among the victors. The Persians, anticipating victory, had brought marble, with which they intended to erect a trophy; this was also found on the field, and was used for that end by their conquerors. The heroes who had fallen were honoured with monuments, and the gratitude of his countrymen was expressed to Miltiades in a picture, which was long preserved in the portico where Zeno afterwards taught his philosophy. But not long after this, having been unsuccessful in a naval expedition, this great commander was accused of taking a bribe from Persia, was condemned to be thrown into the Barathrum, a deep pit, whence none ever escaped; but this sentence was commuted for a fine of 50 talents, which Miltiades being unable to pay, he was thrown into prison, and there died of his wounds.

The war prosecuted by Xerxes, before Christ 486.—Darius, stung with disappointment, resolved to march against Greece in person; but a revolt in Egypt for a while retarded the execution of this design, and it was at last finally frustrated by his death. But Xerxes, his son, by whom he was succeeded, inherited his father's animosity, and prepared to wipe away the ignominy with which repeated and signal defeats had disgraced the Persian arms. The young king's uncle, Artabanes, dissuaded him from involving himself in so rash and needless a war; but he chose to listen to the less prudent advice of Mardonius, who, though beaten by the Greeks in the former war, represented them as cowards that had been only accidentally victorious. War having thus been resolved upon, the most extensive preparations were made for carrying it on with vigour. At the same time Xerxes formed an alliance with the Carthaginians, who engaged to annoy the Greek colonies in the Mediterranean, while he led his army to the conquest of the mother country.

According to the testimony of ancient historians, the Persian army destined to conquer Greece, seems to have been the greatest ever collected. They speak of two millions of fighting men; of eunuchs, women, and slaves, to a still greater amount; and of 1200 ships of war, and 3000 ships of burden. At the head of this immense army, Xerxes began his march; wintered in Sardis; and in spring sent ambassadors from that city to Greece to demand salt and water, as a mark of submission; which being refused, he transported his troops across the Hellespont on a bridge of boats. A large detachment had been sent before the main body to the coast of Macedonia to cut through the isthmus, which joins to that coast the high promontory of Athens, because the doubling of that cape was known to be dangerous. Amidst this vast assemblage of human beings, Xerxes behaved with all the capricious cruelty of a thoughtless despot; urging them to labour by stripes and blows, and inflicting tortures and death on persons of the highest rank; and, with all the self-indulgence of a voluptuary, spending his time in magnificent tents, surrounded by his women and flatterers, or amusing himself with his splendid chariots and swift horses. But, with all the pomp and circumstance of majesty, tokens of his want of inward peace are on record. We are told, that when he viewed his camp from an eminence, his pride was humbled with the reflection, that not one of all the innumerable host could survive a hundred years, and that the thought melted him into tears. But, instead of improving this salutary seriousness, he endeavoured to render it nugatory by plunging into the gulf of dissipation.

In the meantime many of the Greeks sent in their submission. But the Athenians and Spartans, aided by the Thespeans, Platæans, and Eginetes, resolved to withstand the invader. They were able to man a considerable fleet; to raise an army of 60,000 men, exclusive of slaves, whom they could arm to a still greater amount. Themistocles and Aristides divided the city of Athens at that time into two political factions; but though they were both ambitious, they generously agreed to lay aside their rivalship, and to unite their efforts to baffle the designs of the formidable enemy of Greece. Leonidas, the king of Sparta, with 6000 men, was appointed to defend the important pass of Thermopylæ. At first, the king of Persia tried to corrupt the king of Sparta; but failing in this attempt, he sent to him an imperious summons to lay down his arms; to which the magnanimous Spartan replied, *Let him come and take them.* Frequent skirmishes, in which the Greeks had the advantage, were the consequence. The treachery of Epialtes, however, discovered to the Persians a new route across the mountains to the south, and thus rendered the defence of the pass useless. Yet Leonidas did not abandon his post; he told the other inhabitants of the Peloponnesus they might follow the dictates of expediency; but as for the Spartans they had learned to obey only the voice of glory, and that, placed in the first rank by the consent of their country, they would rather die than abandon the post of honour. The Thespians, 700 in number, remained with Leonidas; and the Thebans, lest they should revolt, were not suffered to depart.

Battle of Thermopylæ, before Christ 480.—With these troops, and 300 Spartans, all chosen men, Leonidas resolved to surprise the Persian camp. It was night, and full of resentment, heightened by despair, he marched in close battalion. The fury of the devoted band was terrible, and the tumult, horror, and carnage of the surprised camp beyond description. The morning discovered a dreadful scene of desolation and death; but it also discovered the handful of men by whom it had been occasioned; and, stimulated by revenge, the Persian leader urged his terrified troops to pursue their spoilers, who had retreated to the straits of Thermopylæ. The hostile assailants met, the shock was dreadful, and the battle maintained on the part of the Greeks with desperate valour. At length Leonidas fell, pierced to the heart. On this disaster the Greeks retired to the narrowest part of the strait, when the Thebans revolted to the enemy. The rest continued to resist till overwhelmed with darts and other missile weapons. They were buried under a trophy of Persian arms. Two monuments were afterwards erected on the spot where they fell; on one of which was the inscription, " A handful of Greeks resisted three millions of Persians." The other commemorated the Spartans in these words: " Go, stranger, and declare to the Lacedæmonians that we died here in obedience to their divine laws."

Battles of Salamis and Platæa.—The Persians poured down upon Attica. The inhabitants of Athens, after conveying their women and children to the islands for security, betook themselves to their fleet, abandoning the city, which the Persians pillaged and burnt. The fleet of the Greeks, consisting of 380 sail was attacked in the straits of Salamis by that of the Persians, amounting to 1200 ships. Xerxes himself beheld, from an eminence on the coast, the total discomfiture of his squadron. He then fled with precipitation across the Hellespont. A second overthrow awaited his army by land; for Mardonius, at the head of 300,000 men, was totally defeated at Platæa by the combined army of the Athenians and Lacedemonians. On the same day the Greeks engaged and destroyed the remains of the Persian fleet at Mycale. From that day the ambitious schemes of Xerxes were at at end; and his inglorious life was soon after terminated by assassination. He was succeeded in the throne of Persia by his son Artaxerxes Longimanus, 464 years before Christ.

End of the Persian war.—Cimon, the son of Miltiades, after expelling the Persians from Thrace, attacked and destroyed their fleet on the coast of Pamphylia, and landing his troops gained a signal victory over their army the same day. He afterwards destroyed the Persian fleet of 300 sail, and, landing at Cilicia, completed his triumph by defeating 300,000 Persians under Megabyzes. Artaxerxes now had the prudence to sue for peace, which was granted by the Greeks on terms most honourable to the nation. They stipulated for the freedom of all the Grecian states in Asia, and that the fleets of Persia should not approach their coasts from the Euxine to the extreme boundary of Pamphylia.

Intestine jealousies.—The Greeks had now arrived at a high pitch of glory, which they owed entirely to their union. The peace with Persia, dissolving that connexion, brought back the jealousies of the superior states, the intestine disorders of each, and the national weakness. Sparta meanly opposed the rebuilding of Athens;—Athens, rising again into splendour, saw with pleasure the depopulation of Sparta by an earthquake, and hesitated to give her aid in that juncture of calamity against a rebellion of slaves. A war was the consequence, in which the Athenians were compelled to retreat. Thebes joined with Sparta to curb the ambition of Athens; but her influence extended over all the rest of Bœotia, and was great throughout all Greece. Cimon, who had been some time banished from his ungrateful country, was recalled, and by his mediations brought about a peace between Athens and Sparta. A truce for five, and afterwards for thirty years, was concluded, but was soon broken.

Peloponnesian war.—The state of Corinth had been included in the last treaty between Athens and Sparta. The Corinthians, soon after that agreement, made war upon the people of Corcyra, an ancient colony of their own. The aid of Athens was courted by both parties, and given to Corcyra. Corinth complained of this as an infraction of the treaty with Sparta. War was proclaimed on this ground between Athens and Lacedæmon, each supported by its respective allies. The whole of Greece was then divided into two great confederacies, in which all the Peleponnesian states, with the exception of the Agians, who remained neuter, took part with Lacedæmon, as well as the people of Megara, Bœotia, Locris, and Phocis in the north; and also some of the colonies in the west. The allies of Athens were the inhabitants of Thessaly and Acarnania, with those of the islands of Corcyra, Zacynthus, Chios, and Lesbos. Thrace, Asia Minor, and most of the islands of the Ægean sea, were at that time subject to Athens, and of course under the necessity of taking part in her quarrels. Pericles was then at the head of her councils, and ruled her affairs with little less than arbitrary sway. The Lacedæmonian army, 60,000 strong, commanded by the Spartan king Archidamas invaded Attica, and caused the frighted people to seek refuge with their effects within the walls of the capital. In the meantime, the Athenian fleet ravaged the Peleponnesian coasts, and captured the island of Ægina; while Pericles with the land forces laid waste the country of Megara. In the second year of the war Athens was threatened with inevitable destruction by another visit of the Peloponnesian army, and still more by a terrible plague which raged in the city. The war, however, was still prosecuted with various success on both sides, and with unremitting ardour by each of the hostile armies, till the death of Pericles, when a truce was concluded for 50 years.

The ambition of Alcibiades soon led to a renewal of hostilities. This accomplished but profligate individual advised his countrymen to undertake the conquest of the island of Sicily; the command of the expedition fitted out for that end was given to him; but the attempt was utterly unsuccessful. Condemned by the Athenians, he took refuge among the Spartans, whom, from feelings of revenge he stirred up against his own people. His crimes caused him be expelled from Sparta; and his known abilities made him be recalled to Athens, and placed at the head of her armies. In this situation he was so successful in retrieving the losses of his country, and weakening the resources of her enemies, that they were constrained to sue for peace, which she imprudently refused. Lysander had now the command of the Peloponnesian forces, and having obtained a signal victory over the Athenian fleet at Ægos Potamos, Athens was reduced to the last extremity, and the Lacedemonians blockaded it by land and sea. The war ended by the absolute submission of the Athenians, who agreed to demolish their port, to limit their fleet to 12 ships, and undertake for the future no military enterprize but under the command of the Lacedemonians, 405 years before Christ.

Unsettled state of Greece.—Lysander, who is said to have first violated the constitution of Sparta by the introduction of gold into that republic, having thus gloriously terminated the Peloponnesian war, abolished the popular government in Athens, and substituted in its place thirty tyrants with absolute power. About this time Socrates, the greatest and the best of the Greek philosophers, was condemned to death by poison, on a groundless charge of impiety. On the death of Darius Nothus, his eldest son Artaxerxes Mnemon succeeded him on the imperial throne of Persia. His younger brother Cyrus formed the project of dethroning him; and, with the aid of 13,000 Greeks, engaged him near Babylon, and was there defeated and slain. The remainder of the Grecian army, to the number of 10,000, under the command of Xenophon, made a most amazing retreat, traversing a hostile country of 1600 miles in extent, from Babylon to the banks of the Euxine. Xenophon, who conducted this memorable expedition, wrote an elegant history of it, which has escaped the ravages of time. The part which Greece had taken with Cyrus, engaged Sparta in a war with Persia, in which Athens, through jealousy, did not lend her assistance; and, through the corruption of Persian gold, a general league was formed in Greece against Lacedæmon. After an unequal struggle, the loss of the naval battle near Cnidos utterly dely destroyed the Lacedemonian fleet. A peace was then negociated, and the Spartans, in order to obtain it, gave up to Persia all their Asiatic colonies, and restored the islands of Scyros, Lemnos, and Imbros to the Athenians—a treaty which exhibits a mortifying picture of the humiliation of the Greeks, 387 years before Christ.

Theban war.—The city of Thebes being convulsed with contending factions, that which wished to establish oligarchy as the form of government courted the aid of the Spartans, who embraced the opportunity of possessing themselves of the citadel. Four hundred of the exiled Thebans fled for protection to Athens. Among these was Pelopidas, who planned and accomplished the deliverance of his country. Disguising himself and twelve of his friends as peasants, he entered Thebes in the evening, and joining a patriotic party of the citizens, they surprised the heads of the usurpation amid the tumult of a feast, and put them all to death. Epaminondas shared with Pelopidas the glory of this enterprize; and attacking, with the aid of 5000 Athenians, the Lacedemonian garrison, drove them entirely out of the Theban territory. A war between Thebes and Sparta was the consequence, in which the former was assisted by Athens. But in a short time Thebes had to oppose not only Sparta, but the league of Greece, alone. In this struggle the transcendant genius of her generals, Epaminondas and Pelopidas, became every day more conspicuous. Pelopidas perished in an expedition against the tyrant Pherœa. But Epaminondas gallantly sustained the cause of his country at Leuctra and Mantinea, and fell in the last of these actions, 363 years before Christ. Athens and Sparta were humbled at the battle of Mantinea; Thebes was victorious, but was undone by the death of Epaminondas. All parties were tired of the war; and Artaxerxes dictated the terms of the treaty, in which it was stipulated that each power should retain what it possessed, and that the lesser states should be free from the yoke of the greater.

Philip of Macedon.—Greece was now in a most degraded condition, destitute alike of patriotism, and of military enterprize. In Athens the pleasures of luxury had supplanted heroic virtue; and poets, musicians, sculptors, and comedians, were now the only great men of Attica. Sparta had laid aside the simplicity of her manners, and her power was abridged by the recently acquired independency of the states of Peloponnesus. In these circumstances, so favourable to his ambitious views, Philip king of Macedon formed the project of bringing under his dominion the whole of Greece. He had usurped the throne of Macedon to the prejudice of the rightful heir, and maintained his power by the popularity of his government and the success of his arms. Along with great military talents, he possessed the most consummate address, and had spies and pensionaries in all the states of Greece, by whom every measure was directed to his advantage. His designs on Greece were facilitated by another event. The attempt of the Phocians to plunder the temple of Delphos, excited the *sacred war*, in which almost all the republics of Greece took a part; and Philip's aid being courted by the Thebans and Thessalians, he began hostilities by invading Phocis the king of Attica. The powerful oratory of Demosthenes, glowing with the fire of genius and the spirit of patriotism, was rendered nugatory for rousing his countrymen to a vigorous effort for the preservation of their liberties, by the listlessness of the people, or the counteraction of the eloquence of Æschines, who was bribed to the interest of Philip. The battle of Cheronæa, fought 337 years before the Christian era, decided the fate of Greece, and subjected all her states to the dominion of the king of Macedon. Yet agreeably to the system of policy by which he regulated his procedure, they were permitted to retain their separate governments, while he controlled and directed all the national measures. He now proposed the conquest of Persia, and convoked a general council of the states to arrange the proportional subsidies for each. But before he had time fully to mature his expedition into Persia, he was assassinated by Pausanius, a captain of his guards, in revenge of a private injury.

Alexander the Great.—Philip was succeeded by his son Alexander, surnamed the Great, on account of the magnitude of his achievements. He was in the twentieth year of his age when he came to the throne; and after having reduced the revolted states of Greece to submission, he prepared to prosecute the designs of his father for the conquest of Persia. With an army of 30,000 foot and 5000 horse, the sum of 70 talents, and provisions for a single month, he crossed the Hellespont, and in traversing Phrygia visited the tomb of Achilles. On the banks of the Granicus he was met by Darius Codomannus, king of Persia, with an army of 100,000 foot and 10,000 horse. The Greeks, with Alexander in the van, swam the river, and attacking the astonished Persians, left 20,000 dead on the field, and put the rest of their army to flight. The second battle was fought in the valley of Cilicia near the town of Issus. The Persian army on this occasion amounted to 400,000, of whom the Greeks slew 110,000, and lost only 450 of their own army. The mother, wife, and family of Darius were among the number of the prisoners; and the noble and delicate generosity with which they were treated by their conqueror has always been mentioned to his praise, and affords a proof that humanity was not foreign to his character, had it not been too frequently overshaded by selfish passions. The consequence of the battle of Issus was the submission of Syria, and the treasures of Darius deposited in the city of Damascus. The conqueror next laid siege to Tyre, which he took after a noble resistance of seven months duration. The city was taken by storm, and the victor glutted his revenge by the massacre of 8000 of the inhabitants. After the capture of Gaza, which was gloriously defended by Betis, Alexander obtained possession of the whole of Egypt; and having no employment for his army, he conducted it through the deserts of Lybia to visit the temple of Jupiter Ammon, where he was declared to be a god. On his return he built Alexandria at the mouth of the Nile, long one of the most flourishing cities of the world. On his return from Egypt he was met at Arbela by Darius at the head of 700,000 men. The Persian monarch offered peace, a vast extent of territory, and his daughter to Alexander in marriage. But these terms were rejected, and the Persians again defeated with the loss of 300,000 men. Darius himself, after wandering from province to province, was betrayed by Bessus, one of his own satraps, and cruelly murdered. And thus the Persian empire, which had subsisted about 206 years from the time of Cyrus the Great, submitted to the conqueror, 330 years before Christ. Alexander now thought that nothing was too vast or mighty to withstand his power; he therefore aimed at the sovereignty of the whole habitable globe, and actually penetrated through India to the Ganges, beyond which his troops refused to proceed. He returned to the Indus, and marched his army across the desert to Persepolis; thence he went to Babylon, where he died in a fit of debauch in the 33d year of his age and the 13th of his eventful reign. The title assigned him by the Brahmins of India was—*the Mighty Murderer.*

Fall and conquest of Greece. The mighty empire so rapidly acquired by Alexander, was, on his death, divided by his courtiers into four monarchies. Greece, incited by Demosthenes, made a feeble attempt to regain her independence; but it was too late,—the energy generated by a consciousness of freedom was no more; and hence the pacific counsels of Phocion were better suited to the languid spirit of this once illustrious people. The republic of Achaia made a commendable effort to revive the languishing liberty of the country, but it also proved abortive. And the people of Ætolia having been attacked by the Macedonians, with a rash policy besought the aid of the Romans, who speedily accomplished the reduction of Macedonia. From that time the Romans were hastily advancing to the dominion of all Greece. With this view they studiously fomented dissensions among the states; and the Achæan states having insulted the deputies of Rome, Metellus marched his legions into their devoted country; Mummius, the consul, terminated the work of subjection by the conquest of all Greece, which, from that period, (146 years before Christ,) became a Roman province, under the name of Achaia. See Adam's *Ancient Geography*; Potter's *Grecian Antiquities*; Fraser Tytler's (Lord Woodhouselee) *Elements of General History*; Goldsmith, Gillies, and Mitford's *Histories of Greece.*

GREEN, Matthew, an English poet, was born in London in 1696. His parents were dissenters; the extent of his education, it is said, was only a slight knowledge of the Latin language; and he held an office in the custom-house, the duties of which he faithfully performed. His chief production is "The Spleen," a poem, which it is understood he composed as a relief from his own melancholy. His other poems, which were posthumous publications, are, "The Grotto," "Verses on Barclay's Apology," "The Seeker," and some small pieces, forming altogether a small volume. Green's poetry is truly original; and, though simple and familiar, abounds with uncommon thoughts and striking images; and his poems appeared in Dodsley's and in some other collections. An edition by Dr Aikin was published in 1796. Green died in 1737.

GREENLAND, the most northern region of the western hemisphere, stretches from Cape Farewell in 59° 30′ to the 78th degree of north latitude, or as far as the land has been discovered. It is bounded on the east by the Atlantic ocean, and on the west by Davis's straits and Baffin's bay. Its southern coast does not occupy above one degree, while the boundaries of the northern are altogether unknown. The eastern coast is usually called Old or East Greenland, and the western New or West Greenland.

Discoveries, &c.—Greenland was first discovered in the eighth or ninth century by Eric Raude, a native of Iceland, who drew thither from his own country a number of adventurers, who peopled a great part of the eastern and western coast; and the king of Norway having induced Leif, the son of Eric, to embrace Christianity, that faith was soon propagated among the inhabitants, and churches and bishoprics established in the country. Greenland was afterwards visited about the year 1380 by two Italian noblemen, Antonio and Nicolo Zeno, who drew the first map of that country; by Martin Frobisher in 1576 and 1578; in 1585 by John Davis; and in 1616 by William Baffin. In 1721, Hans Egede, a clergyman of Norway, went to Greenland at the expence of the Danish government for the sake of converting the natives, when both a missionary and trade establishment was effected, which in the course of a year or two was attended with considerable success; and in 1733 the Moravian brethren of Germany formed a settlement in the same neighbourhood, which they designated by the name of New Hernhut.

General aspect and climate.—The climate of Greenland, owing to its northern position, and the winds which blow over its icy valleys and mountains, is extremely cold; in winter the north-east wind is almost insufferable, the thermometer being often at 48° below zero of Fahrenheit. The cold commences in January when the sea freezes; and before the ice begins to be formed the sea smokes and produces a fog called frost-smoke, which has the singular effect of blistering the skin. The aurora borealis sometimes appears in great splendor, and fills the whole horizon with the finest tints of the rainbow, while the crackling sound, like that of electric sparks, and ascribed by the Greenlanders to the souls of the deceased fighting in the air, is distinctly heard. Another remarkable appearance is a circle of brilliant light which is often seen in winter around the moon, while mock suns are very common. From the peculiar state of the atmosphere in clear weather, the islands off the continent seem to the spectator to approach nearer him and to increase in size; sometimes, again, they assume the form of groupes different from the real shape, and appear suspended in the air. Thunder is very rare; but lightning is sometime observed. The rains are of short duration; the air is generally pure, and in some places in summer the heat exceeds 80 Fahren. The ice so hostile to navigation is of two kinds, fresh and salt water-ice. The fresh water ice appears in masses of enormous magnitude and surprising shapes, rising sometimes 500 feet above the water, while the salt water forms what mariners call fields of ice, consisting sometimes of many thousand fathoms extent. Ice-mountains are formed in bays or inlets, vallies, or precipitous rocks projecting into the sea. The driving ice is always accompanied with thick fogs, which renders it still more dangerous to navigators. The large quanties of timber which float with the ice, and which seem to be washed away from shores covered with woods, are very useful to the Greenlanders and settlers for building and fuel.

Lakes and rivers.—The rivers of Greenland are few and small, owing, no doubt, to the scanty sources of water among the perpetual ice. Baal's river, the largest in the country, falls into the sea in the 64th degree of latitude. The springs and rivulets which issue from the mountains commonly dry up in summer. In the vallies, large lakes are often to be met with, formed by the melting of the ice and snow from the mountains. Some spring-wells have been discovered; and one exhibits the phenomenon of rising and falling with the tide, although it is 36 feet above the level of the sea; while another, a warm spring, is remarkable for having at all times a temperature equal to 104° Fahrenheit. The back currents and whirlpools along the coast are numerous; and some of them are not without danger to the navigator.

Mountains.—From its northern limits to its southern extremity, Greenland exhibits a range of inaccessible rocky mountains, separated by narrow vallies, which are never visited by the sun. The higher regions, are covered with enormous masses of ice, which being undermined by the rapid torrents, are often precipitated with a tremendous crash. Some of the mountains in the 62d degree of latitude rise to the height of 3000 feet above the level of the sea, and, excepting in a few hollow places, are free from snow during the summer.

Islands.—Greenland is surrounded by many thousands of islands, of which the smaller exhibit the form of roundish elevations, and the larger consist of barren rocks, with the vallies covered with perpetual ice. But many of these islands, which during the winter are uninhabited, are visited in the spring by the Greenlanders for the purpose of catching seals. In 61° 21′ an uninhabited island of considerable magnitude, called by some navigators, from its terrific appearance, the cape of Desolation, is always surrounded to a great extent with masses of floating ice. Disko, the largest island on the coast, measures a degree from north to south. All the islands from 71° northwards are small, and generally designated Women's islands.

Natural history.—The prevailing rocks on the shores of Greenland belong to the primitive class, and consist chiefly of granite, gneis, micaceous and argillaceous schistus, and porphyry. Limestone is rare; basaltic rocks, containing zeolite and other kindred minerals, are distributed in extensive ranges; and coal, of an inferior kind, and in small quantity, alternates with beds of sandstone in Disko island. The rare mineral cryolite, has hitherto been only found in Greenland, which also furnishes very fine garnets.

During the short spring and summer of Greenland, seldom exceeding four months, vegetation is rapid; and the plants in general, except being of a more dwarfish character, are nearly the same as those of the northern districts of Britain.

Among the marine animals, the whale tribe is conspicuous. The great whale, or Greenland whale, *balœna mysticetus*, sometimes exceeds sixty feet in length; the fin-fish, *balœna physalis*, is an annual visitant of the shores, and is often taken by the natives; and three other species, *balœna rostrata*, the beaked whale, *balæna musculus*, and *boops*, are also inhabitants of the same seas. The porpoise, the sword-fish, and the narwhale or sea-unicorn, frequently appear on the coast. Various species of seal are numerous, and are of immense importance to the Greenlanders in furnishing them with food and clothing, as well as with many articles useful in their simple arts and in domestic economy. The walrus, or morse, is a native of the same seas. Different species of cod-fish are common; and some species of the salmon tribe are not rare; but the *salmo arcticus*, which, in immense shoals, approaches the shores about the commencement of summer, and is taken in great numbers, is one of the most valuable fishes to the natives. It is dried in the sun, and preserved during the winter to be eaten as a substitute for bread. As in other northern regions, Greenland is greatly infested with mosquitoes during the summer months. Birds, common to northern latitudes, and particularly sea-fowl, are numerous. The only quadrupeds of Greenland are, the dog, which is of a large size, and is employed in drawing the sledge, the blue fox, the arctic hare, the rein-deer, and the white bear, which migrates at certain seasons from more northern regions.

Population, &c.—When Hans Egede visited Greenland, the population was said to be 20,000; but since that time great numbers have been carried off by disease, and particularly by the small-pox in 1733, which swept away above 3000 persons, and it is now supposed not to exceed 7000. The inhabitants of West Greenland are called Esquimaux. Their language is the same with that of the natives of Labrador and of part of Hudson's bay, whom they resemble in their way of living. Owing to the cold, and the scarcity of their food, their bodies are of very small size, though not slender. The women resemble the men very much in dress, shape, and masculine appearance. The colour of their bodies, from their dirty habits and the smoke of their houses, is of a yellowish grey; and their oily diet produces such a disagreeable smell, that a European can scarcely remain near them.

The Greenlanders have a very high opinion of their knowledge and information, and take great pleasure in ridiculing the Europeans, to each of whom they commonly give a nickname; they think also they are the most modest people in the world, and nothing is more common with them than the proverb,—"As modest as a Greenlander;" and indeed they are much distinguished for their modesty and amicable tempers, but they are uncommonly revengeful. They have a great propensity to learn, and can be taught easily to read and write their own language, while many can speak Danish with propriety. Their patience in hunger is surprising, and, considering their diminutive size, their bodily strength astonishing.

Their usual dress consists of a sort of close frock, under which they wear, during winter, a shirt made of fowl-skin; to the frock is attached a hood, resembling a monkish cowl, which they draw over the head in bad weather; some of them wear the round hats of Europeans. These frocks, along with their boots and stockings, are usually made of seal and rein-deer-skin, and sometimes very ingeniously from the entrails of whales, dolphins, or seals.

In winter the Greenlanders live in houses, and in summer in tents. At the end of summer each family sets about building a new house or repairing the old one. The houses are built of stone, and are usually from 12 to 18 feet in length, with a window or two of the entrails of the whale. They have no doors and the entrance is so small that it is necessary to creep into them. The houses consist of one apartment, from one end of which to the other is a bench, which is at once a seat, table, and bedstead. A lamp, which serves as a light, chimney, and fire to dress victuals, is always kept burning. The houses are always very warm, and the air is rendered so impure by the evaporation of the inhabitants, that an European cannot continue within doors for any length of time.

The utmost filth and confusion exist in their rude huts; they have always lying in heaps dead seals and fowls, the entrails of animals, and putrid offals of boiled and raw flesh;—every article within smells of smoke and train-oil, with which their bodies are completely covered. In this dirty state it is most disgusting to see them cook and eat their victuals; nor are they more cleanly in their dishes, which they very rarely wash. They have no set time for meals, but usually prepare their game as soon as it is brought in. When they eat they sit upon the ground around a large wooden dish, out of which they take the meat with their fingers; the men partaking first and afterwards the women, who sit at the opposite side of the house. If an European be present, he is obliged to take a piece of the flesh from the woman of the house after she has made it dry from the blood, by licking it over with her tongue.

They usually remove from their houses to their tents in May and April. The tents are not so large as the houses, and are made of stones, poles, and seal-skin. Of the weapons with which they procure their food, which are excellently fitted for their use, the largest is the harpoon; beside which they have a larger and a smaller lance, which are generally used in killing seals. In killing sea-birds the fowling-pike is employed, while for land-game fire-arms are substituted for the Indian bow and arrow formerly in use.

Their canoes are constructed of thin pieces of wood joined with thongs, and covered on the outside with seal-skin; which formation renders them so pliable and elastic, that the roughest sea seldom injures them. In a flat-bottomed canoe called *umiak*, which is about 24 or 30 feet long, their families are conveyed from one place to another; in the smaller canoe, called *kajak*, the men procure sea-game. In the middle of this canoe is a hole with a prominent *ring* of bone or wood, in which the rower sits, fastening the loose part of his frock around it, so that no water can enter. In this position, though overset by a boisterous sea, he can easily recover himself.

The Greenlanders sometimes drive over the ice in sledges, drawn by six or twelve dogs, for the purpose of catching dolphins, sea-unicorns, and seals; and so rapid is this conveyance, that they are carried over a space of 100 miles in nine or ten hours. To the women is allotted every species of domestic drudgery, in which they are engaged from the period that they are twelve years of age.

In their marriages parents never interfere, and the bridegroom pays no regard to a dowry; the only recommendation of the bride is to understand housewifery. The female is usually taken by force from the house of her parents, and carried by the bridegroom to his house, and this forms all the ceremony of marriage. Polygamy is sometimes, but rarely, practised by such as have not embraced Christianity. The wife is sometimes put away by her husband, and if she is dissatisfied she usually elopes, and returns to her parents.

The Greenlanders are a very kind and social people; they never pay visits without making a present of some trifle; and every one who is in want of food or shelter finds a refuge and support in the house of his neighbour. They are likewise very honest in their dealings with each other, though at the same time they do not hesitate occasionally to pilfer from Europeans.

The heathen natives of Greenland have no worship or religion of any kind, but believe in the existence of a Supreme Being, whom in common with many pagan nations they believe to be made up of good and bad dispositions; and besides this Being, they have an idea of certain subordinate spirits, each of whom has its separate locality. The Angelkut are the philosophers and physicians of the Greenlanders, and are thought to be the only persons admitted to the Divine Being. These men live partly by imposing on the superstitious, by pretending to cure diseases by magic, and to preserve health by certain charms. The diseases of the Greenlanders consist most in eruptions of the skin; the chief of which is a kind of leprosy that almost always proves mortal. The measles and small-pox have been repeatedly introduced by Europeans, and have committed great havoc. Many diseases arise from want of food. Often when they have fasted long, they devour their food with such voracity, and in such quantities, that they die of surfeits.

The dead, dressed in their finest clothes, and covered with seal skin, are buried on an eminence; the grave is built of stone above ground; the body is placed in a sitting posture, and the canoe weapons and utensils are laid by the side of the grave.

Language.—The language of the Greenlanders, which has little variety of dialect, abounds with guttural and double consonants. Participles are usually substituted for adjectives; augmentatives and diminutives are very numerous, and each verb has its negative attached to it, and every flexible word its dual. Their numerals are only five; and numbers above five are expressed by addition, as five and one, five and two.

Trade.—The exports from Greenland are feathers and eider-down, horns of the sea unicorn, skins of seals, foxes, bears, hares, and rein-deers, whalebone and oil of all kinds. The imports from Copenhagen are, guns and ammunition, all sorts of ironmongery, various sorts of cloth manufactures, looking-glasses, snuff-boxes, &c.

Fisheries.—The whale-fisheries are chiefly carried on by the settlers, and for the Danish government. The British whale-fishers visit Disko yearly, about the end of April, and leave it in June. The whale-fishers from Holland who formerly resorted to Greenland, were interrupted in their fishery during the whole period of the late war. The Balæna mysticetus, or great Greenland whale only, is caught at this season. The smaller species of whale, *Balaena boops*, which regularly visits the coast about the end of July, is then caught by the native Greenlanders.

Settlements.—The principal settlements for the fisheries on the western coast of Greenland are, Holsteinsburg in 67° 10′, Egedesminde and Wester-island, on the south of Disko bay, Hunde island and Crown Prince island in Disko bay, Christianshaab, Claushavn, and Jacobshavn, on the continent of Disko bay, Godhavn on Disko island, and Klokkerhuck on Arve Prince island. Besides these for the fishing trade, several missionary settlements have been established in different districts of the country by the Moravian brethren, who have long persevered with unceasing assiduity in their pious labours in that dreary and inhospitable region. Besides former works on Greenland, the reader may consult "Scoresby's Account of the Arctic Regions," and Captain Ross's voyage of discovery.

GREENLAW, the county town of Berwickshire in Scotland, stands in a plain which is traversed by the river Blackadder, and nearly in the centre of the county, and contains, including the parish, more than 1200 inhabitants, one half of which is resident in the town. The remains of religious houses connected with the priory of Kelso are yet visible; and Marchmont house, embosomed in woods, is two miles distant.

GREENOCK, a sea-port town of Renfrewshire in Scotland, stands on the firth of Clyde, 22 miles from Glasgow. Before the middle of the 18th century, the houses were crowded together, and the streets narrow, irregular, and incommodious; but from the enterprizing spirit of the inhabitants and the consequent increase of opulence, Greenock has of late years assumed a more elegant aspect in the spacious streets adorned with numerous public and private edifices.

The population has increased with the increase of trade and manufactures. In 1757 it was not more than 4000; in 1741 the number of inhabitants was estimated at 12,000; and in 1811 it exceeded 20,000. The chief manufactures are, brewing, tanning, hats, soap and candles, sugar-refining, brass and iron-work, with ship-building, rope and sail making.

The spirit of commercial enterprise has extended the trade of Greenock to every quarter of the globe. The intercourse with America and the West Indies has been long conducted on a large scale. Since the trade to India was laid open, ships from Greenock are seen in the ports of Hindostan, exchanging the manufactures of Britain for the rich produce of the East; and, for the convenience of trade, the docks and harbours have been greatly enlarged and improved. In 1816, nearly 200 ships, consisting of more than 35,000 tons, were employed in foreign trade; 100 vessels, exceeding 7000 tons, were engaged in the coasting trade; and 70 vessels, including more than 3000 tons, were occupied in the fisheries; and the number of men required for these different branches exceeded 3000. For the year preceding January 1816, the number of British ships that entered the port of Greenock was 347, and of foreign ships 30; and the amount of revenue, chiefly in goods imported for the same period, exceeded L.400,000.

GREENWICH, a town of Kent in England, occupies a charming situation on the south side of the Thames, contains nearly 17,000 inhabitants, and is chiefly remarkable for the magnificent hospital established for the support of invalids from the naval service, and the royal observatory in the vicinity. The latter was erected in 1675 by Charles II. on an elevated spot in Greenwich-park, and it is well furnished with instruments for astronomical observations. The hospital, part of which was formerly a royal residence, was completed on its present magnificent plan in the time of king William and queen Anne; and the funds for its support are derived from the valuable forfeited estates of the unfortunate earl of Derwentwater; from sixpence monthly of the wages of all seamen in the king's or merchant service; from fines for offences on the river Thames, and from private benefactions. This splendid establishment is a noble monument of the gratitude of the nation in making a liberal provision for the ease and comfort of the declining years of those who have fought and bled in her service, who have bravely achieved her triumphs, and placed her in the proud station of unrivalled mistress of the ocean.

GREGORIAN KALENDAR, and GREGORIAN YEAR. See *Chronology*, under HISTORY.

GREGORY, the Reverend JOHN, a clergyman of the church of Scotland, who merits notice as being the ancestor of a race of eminent mathematicians, was minister of Drumoak in Aberdeenshire, between the years 1640 and 1652, and was greatly harassed on account of his refusal to submit to certain forms of church government which were then thought essential, and to accommodate his own opinions to the prevailing doctrines. Having declined to subscribe the covenant, he was seized by the military, imprisoned, fined, and deprived of his living; but after preaching penitentially, according to the language of the times, he was restored. He died about the year 1652. Mr Gregory seems to have directed his attention to some departments of physical science, and is understood to have been among the first persons in Scotland that observed the coincidence between the changes of the barometer and the state of the weather. His wife, the daughter of David Anderson of Finzaugh, was also connected with a family distinguished for mathematical learning. Her brother Alexander was professor of mathematics in Paris. See ANDERSON, Alexander.

GREGORY, DAVID, the son of the Reverend John Gregory of Drumoak, was born in 1628, and was initiated in mercantile affairs in Holland; but having succeeded to the estate of Kinnairdie on the death of an elder brother, he retired to the country, where he chiefly spent the remainder of a long life of 93 years, which terminated about 1720. He had studied medicine, and was much employed in its practice among the poor. The observations on the barometer begun by the father were continued by the son; and, in the ignorance and superstition of the times, brought upon him a charge of witchcraft. Mr Gregory made some improvements in artillery, which, it is said, were communicated by his son to Sir Isaac Newton, who disapproved of the invention as being calculated for the destruction of the human race; but he had the high satisfaction of seeing three of his sons at the same time professors of mathematics in Oxford, Edinburgh, and St Andrew's.

GREGORY, JAMES, a celebrated mathematician, was son of the Reverend John Gregory of Drumoak, and was born in Aberdeen in 1638. He was taught by his mother the first elements of mathematics; and after attending the grammar school of Aberdeen, he passed through the ordinary course of studies in the Marischal college. Devoting himself with the utmost assiduity to the acquisition of mathematical knowledge, he soon began to make improvements upon the discoveries of Galileo, Kepler, and other masters in physical science. When only 24 years of age, he published his "Optica Promota seu abdita Radiorum Reflexorum et Refractorum Mysteria, geometricè enucleata," when he made known his invention of the reflecting telescope, which spread his name over Europe. Two years afterwards he removed to Padua in Italy, the university of which was then famed as a school for mathematics; and in 1667 published at that place "Vera Circuli et Hyperbolae Quadratura," &c. 4to. in which work he announced the discovery of "an infinitely converging series for the areas of the circle and hyperbola;" and shortly after appeared another piece, entitled "Geometriæ pars Universalis," &c. quarto, in which he points out a method for the transmutation of curves. At this time a controversy took place between Mr Gregory and Mr Huygens, regarding the quadration of the circle, which was afterwards conducted with a great degree of warmth. In 1668 he published "Exercitationes Geometricae," quarto, in which he announces an improvement on Mercator's demonstration of Lord Brounker's "Series for Squaring the Hyperbola." At this time he was appointed to the mathematical chair of the university of St Andrew's, which he filled for six years. In 1672 an amicable controversy commenced between him and Sir Isaac Newton, regarding the reflecting telescope, in the course of which he threw out the first idea of a burning concave mirror, which was approved of by Newton, and came into universal repute. In 1674 he was appointed professor of mathematics in the university of Edinburgh. While observing the satellites of Jupiter through a telescope along with some of his pupils, he was struck with sudden blindness, and died in 1675 at the early age of 37. Besides the works already alluded to, he is the author of many papers in the philosophical transactions.

GREGORY, David, an eminent mathematician and astronomer, was the eldest son of David Gregory of Kinnairdie, and nephew of James Gregory, was born in 1611, received the rudiments of learning in Aberdeen, and finished his education at Edinburgh. He soon began to apply himself with uncommon zeal to the study of mathematics, in which he made such rapid progress that in his 23d year he was raised to the mathematical chair in the university of Edinburgh. In 1684 he published "Exercitatio Geometrica de Dimensione Figurarum," &c. in which he improved much of what his uncle had left imperfect, and announced some discoveries of his own. After filling for seven years, with great reputation, the professorship at Edinburgh, he went to London, where he gained the honour of Sir Isaac Newton's acquaintance, and, through his patronage and friendship, was promoted to the Savilian professorship of Astronomy in Oxford, in preference to Dr Halley, who was a competitor. In 1693 Dr Gregory published, in the Philosophical Transactions, a resolution of the Florentine problem, "De testudine veliformi quadrabili," and two years after "Catoptricae et Dioptricae Sphericae Elementa," 8vo, a work which met with general approbation. In 1697 he published the first demonstration that appeared of the curve called *catenaria*, which was inserted in the Philosophical Transactions, and was regarded one of the best discoveries at that time communicated to the Royal Society. In 1702 appeared his "Astronomiae Physicae et Geometricae Elementa," folio, which is the best of his productions, and generally allowed to be the most elegant work on astronomy. It was afterwards translated into English, and a second edition of it was published in 1726. In the following year he published a folio edition of the "Works of Euclid," in Greek and Latin; and afterwards, with the assistance of Dr Halley, he began a new edition of "Apollonius' Conics," but was prevented from completing the work by his death, which happened in 1710. Dr Gregory was also the author of "A short Treatise of the Nature of Arithmetic and Logarithms," and "a Treatise of Practical Geometry."

When Dr David Gregory was advanced to the professorship at Oxford, his brother James succeeded him in the mathematical chair at Edinburgh, held the office for 33 years, and, when he retired in 1725, had for his successor the celebrated Maclaurin, who was recommended by Sir Isaac Newton.

A daughter of professor James Gregory, a young lady distinguished for her beauty and accomplishments, is said to have fallen a victim to an unfortunate attachment, which furnished to Mallet the subject of his pathetic and well known ballad of William and Margaret.

Charles Gregory, another brother, was appointed professor of mathematics in 1707, and discharged the duties of his office with great ability for 32 years, when he was succeeded by his son David, who inherited the peculiar talents of the family, and was the author of a Compendium of Arithmetic and Algebra. He died in 1763.

James Gregory the celebrated inventor of the reflecting telescope, had only one son, who was born at Aberdeen in 1674, and was professor of medicine in King's college, in which office he was successively followed by his two sons James and John.

GREGORY, John, an eminent physician, was born in Aberdeen in 1724, where his father Dr James Gregory was professor of medicine. After finishing his course at the grammar school and university he studied medicine at Edinburgh and Leyden, and on his return was appointed to the chair of philosophy in Aberdeen, which he resigned in 1749, after a year's residence. In 1754 he settled in London, and in the succeeding year was called to the professorship of medicine in King's college, Aberdeen, vacant by his brother's death. In 1764 he published an anonymous work, entitled "A Comparative View of the State and Faculties of Man with those of the Animal World." In 1766 he was appointed professor of the practice of Physic in the university of Edinburgh, and published three years afterwards his two preliminary lectures "On the Duties and Offices of a Physician, and on the Method of Prosecuting Inquiries in Philosophy," a work much admired. In 1772 an outline of his lectures appeared, under the title of "Elements of the Practice of Physic;" but it included only the febrile diseases. He died suddenly in 1773. After his death was published "A Father's Legacy to his Daughters," a book which contains many useful advices for young females; and his whole works were published in four volumes 8vo, in 1788.

GRENADA, one of the Caribbee islands in the West Indies, lies in west long. 61° 40′, and north lat. 12° 10′; is about 24 miles in length and 14 miles at its greatest breadth, and is crossed from north to south by a chain of mountains from which numerous streams take their rise and flow in different directions. The island is surrounded by several bays and harbours, and St George's on the west side is the principal port. The soil is good, and produces fine timber, indigo, sugar, coffee, cocoa, and cotton; and wild game and fish are abundant; parroquets are the most common birds, and the river fish are eels, mullets, and cray-fish. Grenada consists of six parishes, which form two benefices; and the island of Carriacoa, which is annexed to the government of Grenada, forms another benefice. These benefices are

Grenada.

under rectors with L.660 currency of annual stipend. The Methodists and Roman Catholics have each a chapel in the town of St George's. The population in 1811 amounted to 771 whites, 1210 people of colour, and 29,038 slaves, being a total of 31,362. The town of St George's is the residence of the governor.

The French first settled in Grenada in 1638, and in 1650 a colony of 200 men from Martinique effected an establishment; but the Caribs proving irreconcileable enemies to the settlers, hostilities soon commenced and threatened their destruction. From 1714 to 1744 Grenada was in a flourishing condition, having an advantageous trade with Martinique; and in 1748 it again revived. In 1762 the island was taken by the English; the French regained possession in 1779; and by the peace of 1783 it was restored to the English. The contagion of the French revolution, communicated to Grenada by republican emissaries, who effected a landing in 1795, occasioned a barbarous insurrection, which was attended with great cruelty and bloodshed, and continued till June 1796. During the course of the French revolutionary war Grenada again yielded to the arms of Britain.

GRENADA, NEW, a viceroyalty of South America belonging to Spain, extends in length from 3° south latitude 930 miles, and in its average breadth is about 240 miles. This extensive region, from its great inequality of surface, presents every variety of climate. Many of the mountains composing the lofty chain of the Andes, which traverses the viceroyalty, are clothed with perpetual snow. Some districts of New Grenada have been long celebrated for their rich mines of silver and gold. The district of Choco is one of the few places that furnish platina, and in the mountain of Itico the emerald is extracted from veins. The principal rivers are the Magdalena and Cauca, which have their origin and termination in the viceroyalty. The first is a majestic navigable stream.

In such variety of soil and climate, the researches of the botanist will find ample interest and occupation. Many of the woods produced in these regions are extremely beautiful and valuable; the nopal on which the cochineal insect has its residence, is successfully cultivated; many of the plants yield useful medicines; and the wax-palm, the tallest vegetable production, rears its lofty head on the Andes, at the height of nearly 9000 feet. The animals common to South America are found in New Grenada, among which the tapir, the ant-eater, the jaguar, or the American tiger, several species of deer and wild boars, are the chief. The serpents are of large size, and alligators swarm in the rivers.

Of the population of this viceroyalty very different estimates have been made, but it is generally admitted to be on the decline, and is supposed by some not greatly to exceed one million. The kingdom of New Grenada was at first governed by the royal audience founded in 1547; in 1718 the viceroyalty was erected, was suppressed in 1724, and finally established in 1740. *Santa Fe de Bogota*, the capital, stands on the river Funza, 35 miles distant from the Magdalena, is described as a handsome city, with regular and spacious streets and squares. In the neighbourhood of this city is one of the most extraordinary cataracts in the world. The height from which the water falls in a vertical direction is supposed not to be less than 1300 feet.

Carthagena, the capital of a province of the same name, was at one time a very flourishing place, and enjoyed a considerable trade. Of late years, the harbour has been improved, and the city has been increased and adorned with houses of a more elegant and commodious form. *Quito* is said to contain not fewer than 58,000 inhabitants, including Spaniards and Indians. In February 1797, a terrible earthquake, visited this district, by the shock of which mountains were divided in two, and whole towns with all their inhabitants were overwhelmed in the ruins. The town of Riobamba celebrated for its elegance totally disappeared; its place was occupied by a lake; and, of 9000 inhabitants, 400 only escaped the melancholy catastrophe. *Popayan* stands in a fine plain, has regular streets and handsome buildings, and contains 8000 inhabitants. *Panama* and *Portobello* are towns in the northern part of the viceroyalty, the one on the west and the other on the east side of the isthmus, and once enjoyed a flourishing commerce, but it is now greatly on the decline. *Santa Martha* has a good harbour, and was once a place of considerable importance, but the houses are now chiefly of wood covered with straw.

Guayaquil, a province in the southern part of the viceroyalty, extends about sixty leagues from north to south and 45 from east to west, and is divided into seven lieutenancies, over which governors are appointed under the authority of the audience of Quito. These departments are, Puerto Viego, a woody district thinly inhabited, and once noted for a pearl fishery; Punta de Santa Elena, a low fertile country, full of salt-works, and possessing on the rocks a species of shell-fish which affords the celebrated dye of the ancients; Puna, an island at the mouth of the river Guayaquil, about seven leagues square, and full of mangrove trees; Yaguache, a woody and populous place; Babahoyo, a large district, subject to inundations, but productive of cotton, rice, pepper, cacao, and other fruits; Baba, a great district extending to the Cordillera, and abounding in the cacao tree; and Daule, which is fruitful in corn, cacao, cotton, sugar, and tobacco. Great numbers of cattle, horses, and mules are reared in the province, and a plant called *gamalotte*, which grows profusely to the height of seven or eight feet, and resembles barley in the blade, is used for fattening the cattle. The woods furnish abundance of excellent timber, but are infested with insects and noxious animals. Great abundance of fish is obtained notwithstanding the many alligators that infest the river; and, in fishing, the natives use an herb called *barbasco*, which, chewed and mixed with bait, is thrown upon the water to kill or stupify the fish.

The Guayaquil is navigable from the isle of Puna to the town of Babahoyo, and is the channel of commerce for the country. It is navigated by rafts or *balzas*, which carry 400 or 500 quintals, and the principal exports are cacao, timber, salt, cattle, tobacco, wax, pepper, drugs; and ceibo-wool which resembles silk in appearance, is used for filling mat-tresses, and is the product of a high tufted tree. The imports are rum, brandy, oil, fruits, flour, hams, cheese, iron, and cordage; and great advantage to the traders arises from the commercial intercourse between Lima and Quito being conducted through the river. The banks of the Guayaquil are lined with wooden houses raised on posts 12 or 15 feet from the ground, owing to the inundations, during the continuation of which the inhabitants pass from house to house in canoes.

Guayaquil, a city of the province of the same name, extends about a league along the west bank of the river Guayaquil, in south latitude 2° 11′ 21″, is divided into the old and new town, consists of about 2000 houses, and is defended by two forts. The houses are built of brick, and, excepting the church of St Domingo, the convents and churches are built of hard wood. The chalky nature of the soil renders the use of planks on the roads indispensible in the rainy season. The jurisdiction of the city is under a corregidor chosen by the audience of Quito. The population, including strangers, many of whom are Europeans, is computed at 20,000, and the Spanish inhabitants are said to be extremely fresh coloured, handsome, and polite. Water being scarce, the city is supplied in rafts from a distance of four or five leagues. Fish is a principal article of food, and, instead of bread, unripe plantain and different roots are sliced and roasted; but they use great splendour in their entertainments.

The climate is very agreeable from May to December by means of cooling breezes from the mountains; but great heat, constant rains, and immense swarms of insects render the other half of the year almost intolerable. Tertian fevers and distempers of the eyes are prevalent. The trade is considerable, and much cocoa is exported.

GRENOBLE, a town of the department of Isere in France, and formerly the capital of Dauphiny, is situated at the confluence of the rivers Isere and Drac, is distinguished by some of its public edifices, has spacious streets and well-built houses, and is defended by a wall and citadel. The population exceeds 23,000, and the principal manufactures are woollen stuffs, muslins, hats, and gloves, the latter of which are in great estimation in every part of Europe.

GRESHAM, Sir Thomas, an eminent merchant of London, was born in 1519, was educated at Cambridge, and by his industry and prudence in commercial affairs, along with the property which he inherited from his father and uncle, also enterprising merchants, rose to such opulence that he was recorded as the richest subject in the metropolis. He was much employed in negociating the pecuniary transactions of the sovereigns under whom he lived. The death of his only son led him to expend his wealth in public undertakings. For the accommodation of the merchants he erected the edifice which was proclaimed, in presence of queen Elizabeth and her court, the *Royal Exchange*; and he devised his house in Bishopsgate street to be converted into lecture rooms for the seven liberal sciences of divinity, law, physic, astronomy, geometry, music, and rhetoric, with a salary of L.50 to each of the professors. Gresham college being afterwards converted into the excise-office, the salaries have been doubled, and the lectures are delivered at the Royal Exchange. Some eminent men have held professorships in this institution; but the places are now rather to be considered as sinecures than as affording much benefit to the public. Sir Thomas Gresham died in 1579.

GREW, Nehemiah, an eminent writer on the anatomy and physiology of plants, was a native of Coventry, and was born about the year 1628; received his medical education at a foreign university, and on his return to Britain settled as a physician, first at his native place, and finally in London. Dr Grew seems to have directed his attention early to the structure of plants; and the result of his investigations on the subject was first communicated to the Royal society, and was afterwards published in 1682 in one volume folio. He was also the author of several memoirs in the Philosophical Transactions, and of Cosmographia Sacra, or a Discourse of the Universe. He died in 1711, at the advanced age of 83.

GREWIA, a genus of plants belonging to the Gynandria class, the species of which are natives of Asia, America, the Cape, and the South sea islands.

GRIAS, a genus of plants belonging to the Polyandria class, one species of which is indigenous in Jamaica.

GRIELUM, a genus of plants belonging to the Decandria class.

GRIFLEA, a genus of plants belonging to the Octandria class.

GRIMALDI, Francis Maria, an Italian jesuit, who assiduously cultivated the physical sciences, and particularly optics, was born in 1619 and died in 1663. He was the first that observed the elongation of the solar image by prismatic refraction, and he made some discoveries on the diffraction or inflection of light, as it was called by Sir Isaac Newton, who farther prosecuted the same inquiry. The work of Grimaldi, entitled "Physico-Mathesis de Lumine, Coloribus, et Iride," appeared in 1665; and in his speculations concerning light, he concludes that it is an accidental quality.

GRIMSBY, or Great Grimsby, a sea-port town near the mouth of the Humber in Lincolnshire in England, has a fine church and tower, and contains, including the parish, more than 2700 inhabitants. The trade, both foreign and inland, was in former times considerable, but is now chiefly confined to salt and coals. The harbour which was rendered incommodious by the formation of sand banks, has been of late improved, and docks have been constructed.

GRINDELWALD, a village of the canton of Bern in Switzerland, stands in a fine valley, the surface of which is more than 3000 feet above the level of the sea, and the mountains in the vicinity rise to the height of 8000 and 12,000 feet.

GRINSTED, East, a town of Sussex in England, stands on an eminence near the northern boundary of the county, contains nearly 3000 inhabitants, and, beside the church, has a large building called Sackville college, which is employed as a charitable institution for the support of aged persons of both sexes.

GRISONS, one of the nineteen cantons of Switzerland, has for its boundary on the north the canton of Glaris, the Tyrolese on the east, the Valteline and the Ticino on the south, and on the west the canton of Uri, and forms nearly a square of 140 miles; the surface is diversified with numerous ridges and corresponding vallies, through some of which the Rhine, the Inn, and the Adda flow, and some of the surrounding mountains have an elevation of more than 10,000 feet. The population of this territory is estimated at 98,000, of which number two-thirds are protestants. The Italian, German, and ancient French languages are spoken, and the inhabitants are chiefly occupied in husbandry, and more particularly in the management of the dairy, much of the produce of which is exported; and grain, rice, salt, silk stuffs, and cloth of different kinds are imported. The vine is cultivated in some of the vallies, and the manufacture of cotton stuffs is conducted on a limited scale.

GRODNO, a town of Russian Poland, is situated on an elevated spot near the river Niemen, and, before the dismemberment of Poland, was a place of some importance. The meeting of the diets was held in Grodno; the remains of the palace which was the residence of the kings during the time of that assembly are still visible; and a royal academy of medicine was established. The population is estimated at 5000 or 6000, of which one fourth consists of Jews; and the principal manufactures are woollen, linen, cotton, and silk stuffs, hats, lace, cards, and fire-arms.

GROIN is a term in Architecture, denoting the angular curve formed by the intersection of two semicylinders or arches; when the intersecting arches, whether they are semicircular or semi-elliptical, are of the same height and diameter, it is called a regular groin; but a groin in which one of the arches is semicircular and the other semi-elliptical, is said to be irregular.

GRONINGEN, a province of Holland, is bounded on the north and east by the German ocean, Munster, and East Friesland, and on the south and west by Overyssel and West Friesland, is about 47 miles in length, and more than 30 miles at its greatest breadth, and is distinguished for its excellent pastures on which numerous herds of cattle are reared. The produce of the dairy is considerable, and the numerous canals with which the province is traversed greatly facilitate commercial intercourse.

GRONINGEN, the capital of the province of the same name in Holland, is traversed by the river Hunse, is strongly fortified, and contains many excellent houses and public edifices, with a numerous population. Groningen was formerly one of the Hanse towns, and possessed many valuable privileges. The university, founded in 1615, was endowed from the revenues of some ancient monasteries. The trade in butter, horses, and cattle is considerable, and is carried on by means of a canal about 10 miles in length, which forms the communication between Groningen and the sea.

GRONOVIA, a genus of plants belonging to the Pentandria class.

GRONOVIUS, John Frederick, an eminent philologist, was born at Hamburgh in 1611, and, after completing his education, travelled in Germany, France, and Italy; was appointed professor of Greek and Belles Lettres at Leyden, and died in that city in 1672. Beside several original treatises on Roman antiquities, he was the editor of Plautus, Sallust, Livy, Seneca, Pliny, Quintilian, and A. Gellius.

GRONOVIUS, James, the son of Frederick Gronovius, also acquired great eminence as a classical critic, was born at Deventer in 1645, and having for some time held a professorship at Pisa in Italy, was appointed in 1679 to the chair of Greek and History at Leyden, where he died in 1716. Beside the publication of corrected editions of many of the Latin and some of the Greek classics, he was the author of the "Treasure of Greek Antiquities," an elaborate work, in 13 vols. folio. But, with all his erudition, he is justly blamed for the severe and unsparing censures which he throws out against those who hold opinions different from his own.

GROSE, Francis, an eminent antiquary, was born at Richmond in Surrey, in 1731; enjoyed from his father an independent fortune, and entered the militia of his native county as pay-master and adjutant; but, from his careless and dissipated habits, his patrimony was soon exhausted, and he was compelled from necessity to have recourse to his literary talents. With this view he undertook the illustration of the antiquities of his own country, and commenced the publication of "Views of Antiquities in England and Wales," in 1773, and completed it in 1776. These were followed by his "Antiquities of Scotland" in 1790; and if his visit to that country had been productive of nothing else, the admirers of Burns would be gratified to learn, that one of the finest productions of his muse, *Tam o' Shanter*, was suggested during the interview between the poet and the antiquary. Mr Grose died in 1791 at Dublin, while he was engaged in collecting materials for a similar work on the antiquities of Ireland, which appeared after his death. He was also the author of a treatise on Ancient Armour, a Classical Dictionary, Military Antiquities, A Provincial Glossary, and some other works. But of the works of Grose it may be observed, that his language is extremely unpolished, and his antiquarian researches are neither profound nor comprehensive.

GROTIUS, Hugo, one of the most eminent and profound scholars of his own or of any age, was the son of John de Groot, a burgomaster at Delft in Holland, where he was born in 1583. He exhibited in his childhood traits of an uncommon genius, composing, when only eight years old, Latin elegiac verses of great merit. In his twelfth year he was sent to Leyden to prosecute his studies, and his talents soon attracted the admiration of the great Scaliger and of the most learned men of the age, who viewed him as a prodigy, and predicted his future eminence in literature. In 1598 he attended the ambassador of the States to France, where he was introduced to Henry IV. who, as a testimony of his royal favour, gave him his picture and a gold chain; and becoming intimate with the learned, he obtained the degree of doctor of laws. The year following he commenced practice at the bar, and pleaded his first cause at Delft. Soon after he gave to the public his " Capella," which was much admired, and was followed by a translation of Stevinus's treatise on the finding of a ship's place at sea; and in 1600, by an edition of the " Phenomena of Aratus," which Scaliger and others greatly extolled for its profound erudition. About this time also he composed three tragedies on sacred subjects. He was now appointed historiographer to the United Provinces, and advocate general of the treasury for Holland and Zealand. In 1609 appeared his patriotic work. intitled, " Mare Liberum," and soon after another, " De Antiquitate Reipublicæ Bataviæ," to prove the independence of Holland since the time of the Romans, which procured him thanks and a present from the states. By virtue of his accepting the place of pensioner of Rotterdam in 1613, he obtained a seat in the Assembly of the States; and about the same time was sent to England to settle a dispute regarding the Greenland fishery, when he was very favourably received by James I. Soon after, for the active part he took in supporting the cause of the Arminian resmonstrants, he was seized by Maurice, Prince of Orange, tried, and sentenced to perpetual imprisonment, but effected his escape by an ingenious stratagem of his wife, who contrived to get him secretly carried out of prison in a chest. He then took refuge in France, and was introduced to the king, who settled upon him a pension of 3000 livres. Here he wrote his " Apology," which so enraged the States, that they condemned it to the flames and ordered its author to be seized wherever he was. In 1625 he published his famous book " De Jure Belli et Pacis," which was admired throughout all Europe, and is the work on which his fame chiefly rests. In 1731 he ventured to return to Holland, but the States repeating, on his arrival, their order for his apprehension, he went to Hamburgh where he resided two years, when, in consequence of an invitation from Oxenstiern, chancellor of Sweden, he repaired to Stockholm, and was appointed the Queen's counsellor and ambassador to the court of France, the capital of which he entered in a public manner, in that capacity, in March 1735, and remained there negotiating for ten years. When he returned to Stockholm, he revisited, on the way, his native country, and was very honourably received. Being disappointed in his prospects from the Swedish court, he resigned his offices under queen Christina, and, on his way homewards, when arrived at Rostock, he died in 1645.

Grotius was a very voluminous writer, and few have produced such excellent works upon so many branches of learning. He was much distinguished for his composition of Latin poetry; and, when his Prosopopœia of Ostend appeared anonymously, it was ascribed to some of the most famous Latin poets of the age, and was translated repeatedly into French. In divinity, his chief work is his " Treatise on the Truth of the Christian Revelation," which has been translated into all the languages of Europe and even some of Asia, and has become a standard book in all our schools and universities. He likewise composed a commentary on the Scriptures, which is a work of vast learning. As a historian, Grotius is celebrated for his posthumous work entitled " Annales et Historiae de Rebus Belgicis," which is a very impartial history, and seems to be written in imitation of Tacitus. He is, besides, the author of two other historical dissertations.

GROTTO, a cavern or open fissure in the rocky strata of the earth. Cavities of this nature are not unfrequent in limestone; and as the water impregnated with lime passes through the fissures of the rock, the lime is consolidated as the water evaporates, and in this way stalactitical depositions are formed on the floor, the sides, or suspended from the roof of the cavern, and exhibit those striking spectacles which furnish to the traveller the subject of magnificent and probably exaggerated descriptions. Such is the grotto of Antiparos, in the Grecian Archipelago, which is celebrated from the earliest ages; and such also are Elden-hole and Peak's-hole in Derbyshire, and the spar cave discovered of late years in the island of Skye in Scotland. From the floor or sides of some of these grottoes carbonic acid gas, or fixed air, issues, and from its greater specific gravity forms a stratum of air at the bottom of the cavern. Dogs and similar animals respiring the noxious air are destroyed; while human beings respiring the upper stratum of atmospheric air, escape without injury. The Grotto del Cani near Naples is a cavern of this kind. It may be worth while to warn those whose business requires them to enter wells, pits, or caverns, where the air is confined or stagnated, to observe the precaution of letting down a lighted candle, and if the candle refuse to burn, to be assured that the air is certain destruction to animal life.

GROVE, Henry, a learned English dissenter, was born at Taunton in Somersetshire in 1683, was educated at the academy in his native place, and afterwards undertook the superintendance of the same seminary, while he discharged the clerical office in two congregations in the vicinity. Mr Grove was the author of numerous works on theology, which were collected in four volumes octavo after his death, and he was also one of the writers in Addison's Spectator. The papers 588, 601, 626, 635, are assigned to him. He died in 1738.

GROUSE, Moor-fowl or Moor-game, the *tetrao Scoticus* of Linnæus. See Ornithology.

GRUYERES, a town of the canton of Friburg in Switzerland, is chiefly celebrated for the cheese which is known by the same name, and is exported in considerable quantities to all parts of Europe. Gruyeres is 22 miles north-east from Lausanne.

GRYLLUS, a genus of insects belonging to the order *Hemiptera*. See Entomology.

GUADALAXARA, a town of New Castile in Spain, is situated on the river Henares, about 20 miles north-east from Madrid, and contains about 3000 inhabitants, some of whom are engaged in the manufacture of linen.

GUADALAXARA, a district or intendancy of New Gallicia in New Spain in America, is more than 300 miles in length from north to south, and nearly 100 miles in breadth. This district contains many silver mines; the pastures support numerous herds of cattle; maize and wheat are enumerated among its cultivated vegetable productions; and the rearing of the cochineal insect occupies the industry of the inhabitants. The principal town of the intendancy stands on the bank of the river Santiago, is the seat of the supreme courts, the see of a bishop, and contains 20,000 inhabitants.

GUADALOUPE, one of the largest of the Caribbee islands in the West Indies, is between 60 and 70 miles in length, 25 miles at the greatest breadth, and 250 miles in circumference; is situated between Antigua and Martinique, in north latitude about 16° 20′, and west longitude 62°; and is of a crescent form, and divided into two parts by a narrow channel, which runs north and south, and is navigable for small vessels. The island consists of Basseterre and Cabesterre on the west, and Grandeterre on the east. The centre of the west division, which is more properly Guadaloupe, is full of craggy rocks, over which La Souffriere, or the Brimstone mountain, rises to a considerable height, and gives out a thick smoke, which is sometimes accompanied with flame. Among other volcanic appearances the island contains a boiling fountain and a dangerous hot marsh; the sand on the western shore emits a sulphureous odour; and likewise the water is so hot that eggs may be boiled at some distance from the beach. But the air is cooled and the plains fertilized by means of numerous springs flowing from the rocks. The soil is very productive of sugar, coffee, ginger, cocoa, cotton, and indigo; and these, with rum, logwood, and other articles, are exported to a great extent. The island is well stored with cattle, horses, and sheep. The population of the island in 1811 was stated at 94,328 slaves, 12,784 white inhabitants, and 7764 free persons of colour. Guadaloupe is divided into 25 parishes, which, with seven small islands under the same government, make 32 parishes. The Roman catholic religion is observed.

In 1635 Guadaloupe was first visited by the French for the purpose of effecting a settlement; a colony of five or six hundred men from Dieppe was established, but by famine and war with the Caribs was soon greatly reduced; and after a peace in 1640 many of the survivors passed over to Martinique. In 1759 the island was first conquered by the English, and from that period to 1810 it was alternately in the hands of the French and English; and it was ceded by his Britannic Majesty to the king of Sweden in 1813, when the latter engaged to furnish 30,000 men in aid of the allied powers against France, but at the restoration of Louis XVIII. it was finally restored to France in 1815.

In a memoir in the 12th volume of the Linnæan Transactions communicated by Sir Joseph Banks, and containing a report made to General Ernouf, governor of Guadaloupe, on the subject of the human skeletons discovered in the rocks on the shore of that island, the origin of these remains of the human species seems to be satisfactorily accounted for; and the opinion that no traces of the human species have been detected among the organic remains of a former world, so long and so generally adopted, still continues uncontroverted. Of the human skeletons alluded to, a short notice is given of one under ANTHROPOLITE, and its history is more fully detailed in the section on *Organic Remains* under GEOLOGY. In that section we expressed doubts how far it should be considered as belonging to a former world; and these doubts receive ample confirmation from the facts narrated in the memoir. A quarrel arose between the Caribs and Galifs, native inhabitants of the island, and led to a sanguinary conflict, in which many were slain. The battle took place about the year 1710; a person of credit assured the governor that his father recollected it, and some years afterwards saw the remains of human bodies on the spot; and about 1750 the skeletons began to sink into the sand, and to be encrusted with the calcareous covering, mixed with fragments of coral and shells, in which they have been lately found.

GUADIANA, a river of Spain, which has its origin in New Castile, and, after traversing a considerable part of Spain and part of Portugal, falls into the bay of Cadiz.

GUAIACUM, LIGNUM VITÆ, or POCKWOOD, a genus of plants belonging to the Decandria class, and of which one species furnishes the gum resin of the same name which is employed in medicine.

GUALIOR, a strong fortress in the province of Agra in the East Indies, is 800 miles distant from Calcutta, stands on a hill about a mile and a half in length, and about 300 yards in breadth, and was deemed impregnable, till it was taken by the British in 1780. In 1805 it was restored to a native chief. The town of the same name, situated on the east side of the hill, is large and well inhabited, and has a considerable trade in cloth and indigo.

GUAM, the largest of the Ladrone or Marianne islands in the Eastern ocean. See LADRONE.

GUARINI, BABTISTA, an Italian poet, was born at Ferrara in 1537. After being for some years professor of belles letters in the university of that city, he entered into the employment of Alonzo II. duke of Ferrara, who sent him on embassies to several courts, and was so pleased with him that he made him his secretary. Quitting his service from some cause of dislike, he soon after visited Florence, and met with a kind reception from the grand duke Ferdinand, at whose court he staid some time, and then removed to that of Urbino, from whence he returned to his native city in 1605. He died at Venice in 1612. Guarini is the author of the celebrated pastoral drama, "Pastor Fido," which is the best Italian composition of those which rank under that description of poetry, unless perhaps the Aminta of Tasso be excepted. It was translated into numerous languages, and the author, after its appearance, was created member of the chief academies in Italy. Nor is its reputation unmerited; the story is diversified and interesting, and the language beautiful and animated; but the writer often indulges in a display of false wit and superfluous declamation, and sometimes borders on the licentious. Guarini is likewise the author of a work called "Il Secretario," or the art of letter writing, Idropico a comedy, and of various Latin orations, letters, and poems.

GUATIMALA, one of the former three divisions or kingdoms of Mexico, situated between 7° and 20° north latitude, extends about 300 leagues in length and 160 at the greatest breadth, and includes under it eight provinces. It is crossed from west to

Guatimala.

east by a chain of mountains; is deeply indented on the north by the bay of Honduras, and is subject to earthquakes and storms. But the soil is well watered and fertile, the mountains are covered with forests, and the vallies are fruitful and covered with cattle.

Veragua, the most southern province, is about 50 leagues in length, and from 9 to 27 leagues in breadth, is hilly and covered with forests, and possesses some silver mines. The chief river is Veragua, which is remarkable for the greenish hue of its waters. The principal towns are, Conception, the capital; Santiago al Angel; Santa Fe; and Pueblo Nuevo, or new town; and, besides these, upwards of thirteen villages are inhabited by Indians.

Costa Rica lies north-west from Veragua, is about 50 or 60 leagues in length and 40 in breadth, and is mountainous, little cultivated, and thinly inhabited. The chief town is Cartago, the residence of the governor. The mines were formerly profitable, but have been abandoned, and the trade consists chiefly in hides, honey, and wax.

Nicaragua lies between Costa Rica and Honduras is about 80 leagues in length and 50 in breadth, and possesses some high, woody, and volcanic mountains, and a lake 200 miles in circumference, which communicates with the Atlantic ocean. The vallies produce cotton, sugar, honey, wax, and cochineal. The chief towns are Leon de Nicaragua and Granada, both places of considerable trade.

Honduras stretches 180 leagues along the gulf of that name, is well watered and fertile, and is celebrated for excellent logwood. The bay extends about 500 miles, and there are several islands along the coast. The principal towns are, Valladolid; St Jago, 100 miles east from Valladolid; Truxillo, 125 miles north-east; and Puerto de Cavallos, about 90 miles north-west.

Guatimala, bordered on the south and west by the Pacific ocean, is a province of some importance, but greatly subject to earthquakes. The vallies are extremely productive of grain, sugar, cotton, and dye-stuffs, particularly indigo; and the rich pastures are covered with immense numbers of cattle. St. Jago, or Guatimala, a town of considerable trade, is the capital, and seat of a university. This town, originally built in a pleasant valley, was, in 1541, destroyed by an eruption of the mountain Guatimala; it was afterwards rebuilt at some distance, and again destroyed in 1773 by an earthquake; and it now stands in a beautiful plain about eight leagues from its former site. Sansonata, or Trinidad, about 30 leagues to the south-east, is the nearest harbour for ships trading with St. Jago.

Verapaz, or *Coban*, lies north of Guatimala; is about 35 leagues in length and 30 in breadth, and is mountainous, and covered with forests. The chief articles of trade are, maize, cotton, wool, honey, wax, and gums. Verapaz, a small town, is the governor's residence.

Chiapa, north-west from Verapaz, is of a triangular form, and extends about 65 leagues on each side. It is hilly; has two rivers, the Chiapa and the Samasinta; and its chief resources are in grain, fruits, and pastures. Cividad Real, situated in a valley, surrounded with mountains, is the chief town, and trades in cotton, cocoa, and cochineal. This province contains several Indian towns, the principal of which is Chiapa dos Indos.

Guercino
||
Guernsey.

Soconusco, between Chiapa and the Pacific ocean, is about 35 leagues in length and 30 in breadth, is likewise mountainous, and covered with forests, and the vallies produce indigo, cocoa, and fruits.

GUERCINO, a celebrated Italian painter, was born in the territory of Ferrara, and died in 1666, in the 76th year of his age. See DESIGN.

GUERICKE, OTTO, a German philosopher, to whom is ascribed the invention of the air-pump, was born in 1602, and died at Hamburgh in 1686. He was counsellor to the elector of Brandenburg, and burgomaster of Magdeburg. He published several treatises on natural philosophy, and his experiments with the air-pump are detailed in Experimenta Magdeburgica, which appeared in 1672.

GUERNSEY, an island within the bay of St Michael in the English channel, is of a triangular form, about 21 miles in circumference; is bounded on the south and part of the east by lofty cliffs, and on the north by flat bays and high ridges of rocks, and is strongly fortified with batteries and breast-works. About the middle of the island, a level tract of 300 acres which had been inundated above 60 years, was lately embanked and drained. The prevailing rocks are granite, but the south coast is composed of gneiss; and near Prevolet point is a cave 200 feet deep, and 50 or 60 feet in height and breadth.

The climate of Guernsey is excellent; the soil is well watered and fertile, and agriculture is in a state of improvement. The orchards are numerous, and, together with gentlemen's seats, farm-houses, and cottages, beautify the scene. The produce consists of fruits and cyder, butter, pork, and veal,—mackarel, mullets, eels, and lobsters. Sea-weed is the only fuel, and coals are imported from England. The island contains ten parishes, and is in the diocese of Winchester and province of Canterbury; and the laws are administered by a governor, a bailiff, and 12 jurats. Besides the followers of the church of England, there are numerous methodists, and a few catholics. St Peter's port is the only town; the houses are elevated; some of the streets are irregular, but the new town contains many open streets and elegant houses. Among the public buildings are an ancient Gothic church, constructed of granite, and ornamented with a tower and several modern monuments; the court-house, also of granite; the government-house, the college, the new jail, and the workhouse. The market-place is a large open square, and above it are two commodious rooms, which, besides a small theatre, are for public amusements. The public walks are also worthy of notice. The north and west sides of the island contain small harbours; the harbour to the south-east is well adapted for the shipping, and the extensive piers are formed of large masses of granite. The island contains three castles, Castle-cornet, Vale-castle, and the Castle in the Marshes, which are surrounded with walls, and defended with cannon. The population is stated at 15,000; and the principal manufacture is woollen goods, for which 1000 tons of wool are annually imported from England.

GUIANA, a vast region in South America, situated between the great rivers Amazons and Oroonoko, having the Atlantic ocean on the east, and the territories of New Grenada on the west; it lies between the 3° of south and 8° of north latitude, and the 50° and 70° of west longitude.

Aspect.—The country, along the whole extent of its coast, expands into an enormous plain, covered with rich and various vegetation. The coast is rendered dangerous, and even inaccessible in many places, by means of conflicting currents, shoals, rocks, and quicksands. The surface of the interior is diversified by hills and mountains. of different heights, and running in different directions, generally clothed with vast, impenetrable, and gigantic forests. Thence rivers issue carrying immense volumes of water through the country to the ocean, or to the great lateral rivers. Of these streams, the Essequibo, the Demerary, the Berbice, the Canje, the Surinam, the Courantin, the Comewina, the Cottica, Copenane, the Seramica, and the Marawina, flow into the Atlantic; and the first five of them are navigable. The streams which run southward to the Amazons, and northward to the Oroonoko, are also very numerous, and some of them of great size, but most of them are but imperfectly known.

Climate and soil.—Though placed under the line, this country, owing to the cooling influence of the sea-breeze, is far from being the hottest of the tropical regions,—Fahrenheit's thermometer ranging between the 50th and 90th degrees, and generally between the 73d and 84th degrees. The long rainy season begins in April and ends in August; it then continues dry till November; about the middle of which it again becomes rainy, and continues so till the end of January. The interval from this time till the middle of April is dry. Storms of thunder, with vivid, and occasionally destructive lightning, are common at the beginning of the rainy season; but after the weather clears up, the atmosphere is delightful. The country is inundated during the continuance of the periodical rains, and much of it is marshy throughout the year. The soil is extremely fertile; the alluvial deposits being richly impregnated with vegetable matter, constitute a species of manure, which, acted on by the heat and the moisture peculiar to the climate, supports a most luxuriant growth of plants.

Productions.—In the plantations, which are chiefly on the banks of the rivers, are cultivated sugar, coffee, cotton, and cocoa. Among the timber-trees are the iron-wood tree, the mahogany, the red-mangrove tree, which, with a great variety of other kinds, attain a majestic height and great thickness. Dyewoods are abundant; and the fruit-trees are both numerous and various. Medicinal plants are common; and ginger, yams, manioc, and other roots, grow to perfection. The wild animals and beasts of prey are, in general, the same as those described under the article Brazil. The jaguar, the red tiger, the ant bear, several baboon and monkey species, and wild hogs, are the most common. The rivers and marshes are richly replenished with amphibious animals; and among these are, the *manatee* or sea-cow; the tapir, resembling the hippopotamus, but not larger than an ass; the alligator; several sorts of lizards and turtles; and frogs of an enormous size. Serpents are also plentiful, and of different species; and insects, especially ants, are so numerous as to constitute a serious inconvenience. The coast and the rivers are well stocked with fish, amongst which are the frog-fish and the electric eel. Birds of very vivid plumage tenant the forests, the banks of the rivers, and the coasts; but none of them is peculiar to this part of America.

Inhabitants.—Guiana is thinly inhabited by several tribes of Indians, and by settlers from several of the nations of Europe. The native tribes are the Caribbees, a warlike race, that occupy the sea coast as far south as the river Essequibo. They are comparatively industrious, and have fields of plantain and cassava around their dwellings. The next of the native tribes bears the name of the Worrows, who inhabit the sea-coast between the rivers Demerary and Surinam. They have disagreeable features, are timid in their character, and indolent and dirty in their habits. The Accawaws, another of the native tribes, inhabit the interior of the country, near the source of some of the rivers. They are said to be grave and cunning, and are much dreaded from their habit of using poisons to destroy their enemies and such as have incurred their displeasure. The Arrowawes live in the hilly country to the west of that possessed by the Accawaws, are of a lighter colour than the other tribes, and are said to be friendly to Europeans.

European settlers.—The whole of this region has been divided into four great portions, corresponding to the European nations who at different times, or in conjunction, held it in possession, namely, Portuguese, Spanish, French, and Dutch Guiana. The portion possessed by the Portuguese lies on the north bank of the river Amazons, westward from the 53d degree of longitude, and northward to the second degree of north latitude. Spanish Guiana lies on the south bank of the Oroonoko; St Thomas is the capital. French Guiana has the Portuguese portion on the south, and extends for the length of 100 leagues along the coast. The island of Cayenne, 15 leagues in circuit, belongs to this division. Dutch Guiana lies to the south of the river Essequibo, and is bounded on the south by the river Marini. It is fertile, but unhealthy.

Historical notices.—This part of America is said to have been discovered by Columbus in 1498; but its coast was first explored and its interior penetrated by Sir Walter Raleigh, who, in 1595, sailed 600 miles up the river Oroonoko, in search of *El Dorado*, the land of gold. It was next visited by a party of buccaneers. In 1634, a colony, partly English and partly French, were found in Surinam, cultivating tobacco, and was afterwards taken under the protection of Great Britain. In 1667 it was taken by the Dutch, and ceded to them by treaty in 1674, in exchange for the province of New York. Since that time it has been colonized for the different countries mentioned above. But a vast proportion of the country is still in a state of nature, and not likely to be soon reclaimed by the hand of culture.

Guido || Guinea.

GUIDO, Reni, a celebrated Italian painter, was born at Bologna in 1575, and died in 1642. See Design.

GUIDON, a military flag or standard borne by the horse-guards, is broad at one extremity and terminates in a point, or is divided into two at the other. The same appellation is given to the officer who carries the guidon.

GUIENNE, formerly an extensive province of France, which includes the departments of Gironde and Lot and Garonne. The Garonne, Adour, Tarn, Aveyron, and Lot are the principal rivers, and Bourdeaux is the capital.

GUILANDINA, Nickar Tree, a genus of plants belonging to the Decandria class.

GUILD, in the political establishments of the towns in the different parts of Europe, denotes an association or company for the purpose of carrying on trade or manufactures. The term is supposed to be derived from a Saxon word signifying *to pay*, because each member contributed something to the support of the institution. Mercantile associations, or merchant guilds, it is thought, were introduced into Europe about the close of the eleventh century. In the royal burghs of Scotland every person who wishes to enjoy all the privileges of a freeman of the burgh must be a member of the Guild company, or become a burgess and guild brother. But the rights of this association are either not distinctly understood or very imperfectly defined; for the dean of guild and his court, before which all matters relative to buildings, and disputes concerning them between inhabitants, are considered and decided, are not elected by the members, but are nominated by the magistrates.

GUILFORD, the county town of Surrey in England, stands on the declivity of a hill on the east side of the river Wey, has one spacious street, contains three parish churches, several meeting-houses, and some other public buildings, and the ruins of the castle still form a conspicuous object. The population is about 3000; and some trade in corn, timber, and other commodities is carried on by means of the river Wey.

GUILLOTINE, an apparatus introduced into France in 1792, for the purpose of beheading those who were condemned to the punishment of death for crimes against the state, derives its name from the supposed inventor, a physician at Lyons, who received the highest applause from the national assembly for his ingenuity, and was rewarded with a donation of 2000 livres. The history of the French revolution presents a sad picture of the indiscriminate barbarity that prevailed among the ruling party, in subjecting to the stroke of the guillotine those of every age or sex who were suspected of indifference or opposition in political sentiment. As a warning of the summary executions to be expected during the reign of terror, the figure of the guillotine was represented on coins, and it was constructed in such a manner as to become portable, and to constitute part of the travelling equipage of the commissioners appointed by the national assembly.

GUINEA, an extensive region on the south-west of Africa, is divided into Lower and Upper Guinea; but the boundaries are variously stated. Lower Guinea, which has not been sufficiently explored, extends from the kingdom of Benin to Cape Lopez;

Guinea.

and Upper Guinea, extends from east to west, about 1500 miles along the coast, and consists of Sierra Leone, Malaquella, or the Grain coast, the Ivory coast, the Gold coast, the Slave coast, and the kingdom of Benin, for which see Benin.

Sierra Leone.—This mountainous district is by some limited between Cape Verga and Cape Tagrin, but, by others, it is said to extend from the Grain coast on the south east, to Cape Verga on the north-west. It is traversed by a great river of the same name on both sides, of which the climate and soil are very favourable. In other parts the temperature is similar to that of the West Indies. In the higher grounds the air is clear, but the valleys are enveloped in mists and vapours.

The vegetable productions are very numerous, but rice, cassada, and Indian corn constitute the principal food of the natives. The great number of lions in Sierra Leone suggested the name of the country, which also abounds with many other animals common to the west of Africa.

The natural advantages of Sierra Leone pointed it out as an elegible situation for establishing a colony; and in 1786, about 400 negroes, and 60 whites, were, from idleness and misery in the streets of London, sent out at the expence of government to settle on a piece of ground which was obtained for them from the king of the country. This colony did not succeed; but, in 1791, the plan of an establishment for the purpose of civilizing the Africans, and effecting a commercial intercourse, was proposed and agreed to by a number of subscribers who were incorporated as the *Sierra Leone Company*. Proper arrangements were accordingly made, and several ships sailed in 1792. The settlers on their arrival proceeded to build Free Town; they were situated in agreeable terms with the natives, and the most desireable prospects were entertained; but the prosperity of the colony was cruelly checked by the arrival of several French ships in 1794, when the most destructive ravages were committed. In 1798, Free Town consisted of about 300 houses, and some public buildings, and of about 1200 inhabitants; only 30 were Europeans. In 1800, matters were arranged for controuling the turbulent blacks from Nova Scotia, and parliament granted L.4000 for supporting the civil establishment, and L.7000, with a promise of L.8000 more, for the purpose of building a fort. In 1802, parliament voted L.10,000 for defraying the expences of the colony; in 1803 it was proposed to transfer the civil and military power to the British Government, and since that period considerable progress has been made in the erection of works, and in effecting the security of the place. But as a considerable force is indispensable for the defence of the colony, the expence of the civil establishment is considerable; in 1809 it amounted to L.17,000, and for the year 1820 a grant of L.22,388 was made by Parliament.

Grain Coast extends about 100 leagues from Mesurado to cape Palmas, lies low, and is well watered and covered with forests. This district, which is but little known, consists of a number of villages, at one of which, Tabo Dragon, the French established a factory. The natural productions are rice, grain, pepper, leather, ivory, and gold dust.

Ivory Coast extends from west to east about 110 leagues, and consists of *Cape Palmas*, which is covered with palms and numerous villages, the principal of which, Lahon, is visited by Europeans. The mountains which bound this coast are covered with wood, and the valleys are productive of cotton, indigo, cocoa, and rice. The trade consists chiefly in gold, ivory, salt, and cotton.

Gold Coast stretches about 350 leagues in a westerly direction from cape Apollonia, and contains many extensive settlements belonging to the Dutch, British, and Danes. The chief of these settlements are, Elmina, which belongs to the Dutch, has a population of 15,000, and a considerable trade; and cape Coast Castle, which belongs to the British, and has a population of 8000, and considerable trade in gold. The principal river is Rio Volta.

Slave Coast, about 50 leagues in extent from Rio Volta to Rio Sagos, consists of four districts, Koto, Popo, Juida, and Ardrah, and the trade is in salt, palm oil, and slaves.

Guinea has from the sea the appearance of a vast forest, and indeed vegetation is extremely luxuriant, excepting some tracts near the shores. The soil is well suited for cultivation, and watered by rivers which wind in different directions. The climate is more temperate than in other parts of Africa. The rainy seasons set in about the months of May and October, which are followed by foggy weather, and the dry season continues from November to May, during which period tornadoes and harmattans, or easterly winds, prevail with great violence, and are accompanied with storms of rain, wind, and thunder.

Among the vegetable productions of Guinea, may be enumerated maize, millet, rice, yams, cassada, potatoes, plantains, bananas, and guavas; the sugar cane and cotton shrub grow spontaneously; the silk cotton tree grows to a great size, and also the palm tree. The mountains, which consist of primitive rocks, abound in mines of gold and iron, but the natives are not acquainted with mining, and either dig at the foot of the mountains or search in the beds of rivers for the gold. The animals found in Guinea are lions, elephants, panthers, buffaloes, leopards, hyenas, jackals, the hippopotamus, alligators, snakes, and many others; and domestic animals and poultry are abundant. The feathered tribes are various; turtle is common, and fish is very plentiful.

The coast of Guinea is peopled by distinct tribes, some of whom are industrious and peaceable. Those who inhabit the interior are more powerful, and their districts, of which Dahomy and Ashantee are the principal, are more extensive than those of the coast. Their customs are very similar, though they differ in modes of government. The laws in general are strict; but the worst crimes may be compensated by the payment of fines. At Apollonia the person accused of crime has commonly to prove his innocence by the ordeal, that is, swallowing a quantity of poisonous bark, which, if it prove fatal, is considered a testimony of guilt. The religion of Guinea is grossly superstitious; the moon is much worshipped; in some places an annual sacrifice is made to the god Fetish; and every town or village has its favourite idols. The languages and dialects of the different tribes are various, and the Fantee is more generally spoken. The dress of both sexes is a piece of cloth four yards long and two broad wrapped round the body. The women of quality wear bracelets, necklaces, beads, and a number of silver keys in front of the girdle; and both sexes decorate the head. The Fantees are a remarkably clean people, and wear white.

The principal articles of food are bread of Indian corn and soups of fish and poultry, highly seasoned with pepper, salt, and palm-oil, and after meals they use spirits and palm-wine. The houses are built of bamboo and plaistered with clay. Dancing and music are common amusements. Polygamy is common, but the first wife holds the superiority; and daughters are disposed of in marriage by their mothers, who always receive certain presents on the occasion. At funerals, revellings and sacrifices are practised.

Agriculture and manufactures are but in a rude state in Guinea. The men are mostly employed in fishing, planting, or making canoes, baskets and fishing materials, and the women are subjected to the grinding of corn and other hard labour. The trade with Europeans is confined to the coast, and in exchange for pepper, ivory, gold, and other articles, woollen and cotton goods, spirits, tobacco, and tobacco-pipes, iron, lead, fire-arms, and gunpowder are imported.

GUITAR, a musical instrument, which, it is supposed, was introduced into Spain by the Moors, and is still common in that country as well as in Italy. It is usually strung with double wire, but in Spain with cat-gut, which gives it a more delicate tone.

GULF, a term in geography, denoting a bay included between two promontories; and when the expanse of water is considerable, it sometimes comes under the denomination of a *sea*, as the Adriatic gulf or sea, the gulf of Persia, or the Red sea.

GULF-STREAM, a powerful current which issues from the gulf of Mexico, between cape Florida and the island of Cuba, and, skirting the coasts of America, advances eastward to the banks of Newfoundland. It is supposed to be occasioned by the trade-winds producing an accumulation of water from the Atlantic in the gulf of Mexico. See Geology.

GUM, a concrete vegetable juice, without taste or smell, soluble in water, and forming with it a tenacious liquid; such are gum-arabic, gum-senegal, and the gum that exudes from the bark of the plum and cherry tree of this country. See Chemistry.

GUM RESIN is a concrete juice obtained from various vegetables, and composed partly of gum and partly of resin, so that it is only partially soluble in water; see Chemistry;—and for the properties of such gums and gum resins as are employed in medicine, see Medicine.

GUN, a fire arm or instrument of offence, by which a ball or other hard or solid matter is discharged through a cylindrical tube, by the explosive force of gun-powder. For the manufacture of guns, see Metallurgy.

GUNDELIA, a genus of plants belonging to the Syngenesia class.

GUNNERY is the art of constructing, charging, directing, and exploding fire-arms. For the method of constructing and the practical management of fire-arms, see WAR; and for the theory of gunnery, which depends on the laws of projectiles, see MECHANICS.

GUNPOWDER, a compound of nitre, sulphur, and charcoal. See CHEMISTRY.

GUNTER, EDMUND, an English mathematician, was born in Herefordshire in 1581, and was educated at Westminster school and Oxford. In 1606 he published a new projection of the sector, and in 1618 an invention of a small portable quadrant, which goes by his name, and added so much to his reputation that in the year following he was promoted to the professorship of Astronomy in Gresham college. The year after his appointment he published *Canon Triangulorum sive Tabula Sinuum Artificialium*, &c.—a work which was of vast use to students in the practical parts of astronomy. In 1622 he discovered the variation of the magnetic needle, and soon after invented his well known "Rule of proportion," which is a method for combining arithmetic and astronomy, intelligible to the meanest capacity, and goes by the name of "Gunter's proportion," while the instrument used in the process is commonly called the "Gunter." In 1624 he published "the Cross-staff," in three books, &c., which contain improvements on the sector, quadrant, and other instruments; and in the same year, by order of king James, "The description and use of his Majesty's dials in Whitehall garden." He died in 1626. His works were collected into one volume quarto in 1673.

GUY, THOMAS, a bookseller of London, but better known as the founder of the hospital in Southwark which bears his name. He began his apprenticeship in 1660, and having commenced business for himself with a small capital, he engaged in the importation of English bibles from Holland, which, on account of the advancement of the art of printing in that country, were better executed than in England; and by this speculation and the most rigid economy, he accumulated a great deal of money. But the bulk of his fortune was acquired by purchasing seamen's tickets during queen Anne's wars, and by South sea stock. Mr Guy was in his 76th year when he formed the design of building the hospital, and he lived till the year 1724, when it was roofed in. The expense of its erection exceeded L.18000, and the sum which he bequeathed for its endowment was more than L.219000.

GUZERAT, a province of Hindostan, lying between the 21° and 24° of north latitude. See HINDOSTAN.

GYMNASIUM, a place fitted up by the ancient Greeks for the performance of gymnastic exercises, which were so called because those who engaged in them divested themselves of those garments which encumbered the free motion of the body. The gymnastic exercises included feats of horsemanship, chariot races, wrestling, boxing, running, leaping, throwing the quoit, and launching the javelin.

GYMNOSOPHISTS, a sect of Indian philosophers, who were so called because they went barefooted. They believed in the immortality and transmigration of the soul, and placed the chief happiness of man in a contempt for the goods of fortune and the pleasures of sense. They were averse to idleness and indolence, and were zealously devoted to the study of wisdom.

GYMNOSPERMIA, one of the orders of the Linnæan class Didynamia, and comprehends those plants which have naked seeds.

GYMNOTUS, a genus of fishes belonging to the order of Apodes, and of which one species, called *electricus*, possesses the power of communicating shocks of electricity. See ICHTHYOLOGY.

GYNANDRIA, the twentieth class in the Linnæan classification of plants. See BOTANY.

GYPSIES, a singular race of men who for several centuries have led a wandering life in different parts of Europe and Asia; in tracing whose origin and history the researches of the antiquary have been unsuccessful; and, in the detail of their customs and manners, exaggerated representations have been given. It is generally believed that this race of people first appeared in Europe about the beginning of the 15th century; and, as the name is supposed to indicate, that they emigrated from Egypt. But, according to some, the origin of the Gypsies is to be traced to Hindostan, where a race of people in similar circumstances, and with a language somewhat similar, still exists. The cause of the emigration of the Gypsies from India is ascribed to the war of Timur Beg, who in the years 1408 and 1409 conquered and ravaged that country, and put to death all who resisted his authority. When this wandering tribe appeared in France in the year 1427, they were known by the name of Bohemians. It is not particularly specified at what period the Gypsies were first seen in Britain; but it is obvious, from the legislative enactments which were made in the time of Henry VIII. and his successors Mary and Elizabeth, that they had become troublesome inmates. About the same time similar laws were passed in Scotland with regard to the Gypsies, who it is generally admitted were never so numerous in the northern part of the kingdom. The depredations of the Gypsies had risen to such excess in England, that in the year 1531 they were commanded to depart from the kingdom within the short period of 16 days; and in the beginning of the 17th century, by a decree of the privy council, it was ordained that the whole race should quit Scotland under pain of death; and it seems not at all improbable that these edicts, unduly severe in themselves, were executed with barbarous severity, for even such as associated with the Gypsies for one month, whether a stranger or natural born subject, was declared to be guilty of felony without benefit of clergy. But it would appear that the Gypsies at one time enjoyed some indulgence, and even the protection of the Scottish government; for in 1553 John Faa obtained a writ from Queen Mary for the purpose of enforcing subordination to his authority among his own people; and in 1594 a similar writ of privy seal, in which he is designated lord and earl of Little Egypt, was granted to the same person, and for the same purpose. Not many years afterwards, the same family either forfeited this indulgence, or were treated with greater harshness, for beside a number of men of the name of Faa who were condemned to death for being found in Scotland, and for petty offences, ten or eleven females were sentenced to be drowned, according to the same statutes.

The principal occupations of the Gypsies are such kinds of foundery and smith's work as can be easily executed with a portable apparatus. The manufacture of horn spoons, and of Jew's harps, formed also part of the profession of this race; hence, in carrying on these trades, they found it necessary to wander about the country; and hence probably the origin of those excesses and vices with which the Gypsies have been liberally charged may be traced to their roving mode of life, and to the precarious subsistence to which they were continually exposed, rather than to any unusual depravity of disposition or peculiarity of character which belongs not to mankind in general.

In Scotland the Gypsies seem to have been chiefly confined to the southern and western districts; the family of Faa was chiefly found in the vicinity of the Tweed; and to those who are acquainted with Galloway and Ayrshire, the name of Marshall, connected with a race of Gypsies or tinkers, the more ordinary appellation of that people, must be quite familiar. About thirty years ago a family of that name had a pretty permanent residence in the suburbs of the town of Ayr, and about the beginning of the 18th century entire villages were occupied by people of the same description. The ruins of one of these villages in the immediate vicinity of Stevenston, near Saltcoats, are still recollected by many persons yet living. A very elaborate, but at the same time a fanciful, and in many parts an exaggerated account, of the Gypsies, has been drawn up by Grellman, a German author, and notices are introduced of the same people in the travels of Swinburne and Twiss in Spain, as well as in the description of other parts of Europe and Asia by other authors.

GYPSOPHILA, a genus of plants belonging to the Decandria class.

GYPSUM, Plaster-stone, or Plaster of Paris, or Alabaster, a mineral substance composed of sulphuric acid and lime. See Geology.

GYRINUS, Glimmer-chaffer, a genus of insects belonging to the order of Coleoptera. See Entomology.

H.

H, the eighth letter, and the sixth consonant of the English alphabet, is similar to the same letter in the Roman alphabet, the form of which is derived from the Hebrew. This letter is sounded by a strong expiration of the breath between the lips, which are closed by a gentle motion of the lower jaw to the upper, and the tongue nearly approaching the palate.

As an abbreviation, the letter H was used by the ancient Romans to denote homo, hæres, hora, as H. B. hæres bonorum. As a numeral H was employed to denote 200, and with a dash over it, $\bar{H}$ 200,000.

HABAKKUK, one of the canonical books of the Old Testament, and of the twelve lesser prophets, in which are described the disorders which had crept into the Jewish nation, and in which also is announced the threatened punishment.

HABEAS-CORPUS, a term in English law, denoting a writ which is issued from the court of King's Bench, or from the judges of that court, ordering a prisoner who has been confined by the warrant of an inferior judge, or magistrate, to be brought into court, that the grounds of his imprisonment may be examined. This writ furnishes the great remedy against oppression by false imprisonment. See Law.

HABIT is an aptitude either of the mind or body to perform any act, and is acquired by frequent repetition.

HABIT and Repute, a term in the law of Scotland, expressive of the character which a person holds in the society in which he lives with regard to any vice or crime with which he is charged. Thus a person guilty of the crime of theft is subjected to a severer punishment, when it is fully established that he is habit and repute a thief.

HACKNEY, a parish and large village of Middlesex, from which it is said coaches and other vehicles of conveyance let for hire derive the name, because the citizens of London employed such modes of conveyance for the purpose of visiting their friends at Hackney, and hence the appellation has become general throughout the kingdom. See Middlesex.

HADDINGTONSHIRE, or East Lothian, a county of Scotland, has for its boundaries on the west Edinburghshire or Mid-Lothian, on the north the firth of Forth, on the east the German ocean, and on the south the great ridge of the Lammermuir hills, by which it is separated from Berwickshire, and is about 25 miles in length, and from 12 to 16 miles in breadth. Excepting towards the south, the greater proportion of this county is a flat district, and is covered with a rich and fertile soil. That portion of the county which extends into the Lammermuir hills, presents somewhat of a mountainous aspect, but affords excellent sheep pasture. The only river of note is the Tyne, which has its source on the borders of Peebleshire, traverses the county from south-west to north-east, and falls into the firth of Forth between North-Berwick and Dunbar.

The rocks of this county belong chiefly to the secondary class. In the immediate vicinity of Dunbar the basalt appears in a columnar form; the rocks which compose North-Berwick law, near the town of the same name, are also of a basaltic nature, and Traprene law consists chiefly of clink-stone or schistose porphyry, which on the south side also assumes a columnar form. Limestone is abundant in some places, and is extensively wrought at Salton and Pencaitland. Coal is also abundant in the vicinity of Tranent, but no indications of that valuable mineral have been observed, or indeed can be expected, from the nature of the rocks farther to the eastward.

The population of this county, which in 1801 amounted to 99,127, had increased to 107,264, according to the census taken in 1811.

The husbandry of this county has reached the highest state of perfection. The farms are generally large, and with the capital and skill employed in their cultivation afford crops that are scarcely inferior to the produce of the richest districts of south Britain. The manufactures are not on a large scale, and are chiefly confined to woollen stuffs, pottery, oil of vitriol, sal-ammoniac, and some other chemical preparations. Fisheries are carried on at Dunbar and other places on the coast, and the trade is chiefly limited to Musselburgh and Dunbar, and at the latter place was at one time considerable.

This county is divided into 24 parishes, and it contains three royal boroughs, Haddington, North Berwick, and Dunbar, and the villages of Tranent and Prestonpans, with some others of smaller note.

Haddington, the county town, stands on the banks of the Tyne, and consists of four streets, which cross each other nearly at right angles. The streets are generally spacious and the houses well built. The town-house, from a design of Mr Adam, is a handsome structure; the church of the Franciscan monastery, part of which is occupied as the parish church, still remains, and is a venerable edifice; the Nun-gate, connected with the town by means of a bridge, derives its name from the nunnery founded in the 12th century, the ruins of which are still visible.

The population of Haddington, including the parish, in 1801 amounted to 4049, and in 1811 had increased to 4370. The manufacture of coarse woollen stuffs, which was attempted some years ago in the town and suburbs, is said to have been unsuccessful; and the only extensive works in the neighbourhood are a distillery and flour-mill, which is driven by steam. John Knox, the strenuous reformer, was a native of Haddington, and the house in which he was born is still pointed out.

Dunbar is a royal borough, 11 miles distant from Haddington, stands on a gentle eminence, and consists of a spacious street lined with many excellent houses. The ruins of the castle, a place of great antiquity, are yet visible. The population of the town and parish of Dunbar, which in 1801 was estimated at 3951 remained nearly stationary in 1811. No manufactures of any importance have been established excepting rope-making. The trade, at one time considerable, is now limited to the exportation of corn from the rich districts in the vicinity.

North-Berwick is an ancient royal borough on the shore of the firth of Forth, and about seven miles from Haddington. A few of the inhabitants are employed in the fisheries, and some grain is exported. In the vicinity of the town is the conical hill called North-Berwick law, which rises to the height of 800 feet, and two miles to the eastward are the ruins of Tantallan castle, a stronghold of the powerful family of Douglas. The population of North-Berwick in 1801 is stated at nearly 1600, and it is not probable that it has since undergone any material alteration.

Prestonpans is a town on the firth of Forth, chiefly remarkable for the manufacture of salt, which has been long extensively carried on. The manufactures of earthen-ware, sulphuric acid, and some other chemical productions, have been also introduced. The fishery of oysters has been long an object of considerable importance. The harbour of Prestonpans, called Morrison's haven, is at a short distance to the westward of the town. Near the village of Preston the rebel army in September 1745 defeated the king's troops, and in that engagement the brave colonel Gardiner lost his life. Near the same village is Preston tower, now in ruins; and Preston house, now occupied as an hospital for the maintenance and education of boys, was founded in 1784 by James Schaw, the proprietor of the estate of Preston; and in the same vicinity is an ancient structure of an octagon form, and having a tall shaft or pillar rising from its centre, exactly resembling a similar edifice which stood on the High street of Edinburgh, and another of the same kind, and, from the description, seemingly of the same form and dimensions, which stood on one of the principal streets in the town of Ayr. The population of the town and parish is about 2000.

Tranent is a considerable village, which contains, including the parish, more than 3000 inhabitants. The church is an ancient Gothic structure, and the ruins of a collegiate church founded in 1493 are yet to be seen in the village of Seton in this parish. Coal is abundant in the parish of Tranent.

HADLEIGH, or Hadley, a town of Suffolk in England, stands on the river Preston, and contains about 2600 inhabitants, who are chiefly employed in the spinning of yarn for the supply of the manufactures of Norwich. The church, an elegant structure, the altar-piece of which is much admired, is the chief ornament of the place.

HÆMANTHUS, Blood-flower, a genus of plants belonging to the Hexandria class.

HÆMATITES, an ore of iron. See Geology.

HÆMATOPUS, the Sea-Pye, a genus of birds belonging to the order of Grallae. See Ornithology.

HÆMATOXYLUM, Logwood, or Campeachy Wood, a genus of plants belonging to the Decandria class. For the properties and use of this wood as a dye-stuff, see Dyeing.

HÆMOPTYSIS, or Hæmoptoe, from the Greek, signifying a spitting of blood, for which see Medicine.

HÆMORRHAGY, from two Greek words signifying a flow of blood, is a flux of blood from the nose or any other part of the body. See Medicine.

HAERLEM, a town of Holland. See Harlem.

HAGGAI, one of the lesser prophets, who by the command of God exhorted the Jews to complete the rebuilding of the temple.

HAGIOGRAPHIA, a term derived from the Greek, and signifying *holy writing*, was applied by some of the fathers of the church to part of the books of Sacred Scripture.

HAGUE, one of the finest towns of Holland, is about three miles distant from the coast, and 14 miles south-west from Amsterdam. The streets are spacious, and adorned with trees, canals; and handsome bridges; many of the public buildings are magnificent structures, and the scenery in the vicinity is adorned with groves of fine trees. The population is estimated at 40,000, and formerly the printing of books occupied the industry of many of the inhabitants.

HAIL is supposed to be the drops of rain frozen by a sudden change of temperature in the higher regions. See Meteorology.

HAINAN, an island lying between the 18° and 20° of north latitude on the Chinese coast, and subject to the Chinese empire; extends from east to west about 60 leagues, and from north to south about 45 leagues; and is under the authority of mandarins. It produces a wood which is held in high estimation on account of its durability and fragrance.

HAKLUYT, Richard, an old English author, is supposed to have been a native of London, and was born about the year 1553. He received his education at Westminster school and Oxford, and early devoted himself to the study of cosmography, on which he read public lectures. Having taken orders in the church, he attended the English ambassador to France as his chaplain, and was first promoted to a prebend at Bristol, and afterwards to the same clerical rank at Westminster. He died in 1616. He was the author of a Collection of Voyages, in three volumes folio, beside some translations from the Portuguese language.

HALBERSTADT, a small principality of Lower Saxony in Germany, is about 40 miles in length and 30 miles in breadth; is fertile in corn and flax; and contains 200,000 inhabitants, the greater proportion of whom belongs to the Lutheran persuasion. Woollen stuffs are the principal manufactures, and grain and a particular kind of beer are exported.

Halberstadt is the capital of the principality. The cathedral and some of the churches, to which are attached valuable libraries, are elegant structures, and the principal inn is on a very large scale, and affords excellent accommodation to travellers. The population is estimated about 12000; and manufactures of woollen and linen stuffs, gloves, and paper have been established. Extensive gardens have been formed in the vicinity according to the English style.

HALCYON, the ancient name of the king-fisher, and hence *halcyon days* is a figurative expression of the poets, denoting calmness and tranquillity, because it was applied to seven days before and seven days after the winter solstice, during which the serenity of the weather at that season induced the halcyon or king-fisher to deposit its eggs in nests constructed on the rocks near the margin of the sea.

HALDE, John Baptist Du, a learned French author, was born at Paris in 1674, and was charged by the Jesuits with the care of collecting and arranging the information which they received from their members travelling in different parts of the world. He died in 1743. He was the author of "The Description of China and of Chinese Tartary," in four vols. folio, and the editor of a large proportion of "Instructive and Curious Letters."

HALE, Sir Matthew, a learned English lawyer, was born in 1609, and was educated at Oxford. Entering into the practice of his profession during the disastrous period of the civil wars, he was fortunate, by the moderation of his conduct, in securing the esteem of persons of both parties. He was one of the judges of the Common Pleas under Oliver Cromwell, was appointed chief baron of the Exchequer in the time of Charles II., and in 1671 was advanced to be lord chief justice of the King's Bench. He died in 1665. He was the author of various essays on mechanical philosophy, as well as of some moral and religious treatises; and "Pleas of the crown," a work still referred to, was published after his death, in two vols. folio.

HALES, Dr Stephen, an English divine and naturalist, was born in 1677, and was educated at Cambridge; and one of the earliest studies to which he seriously devoted himself was botany, which he prosecuted along with his learned friend Dr Stukely. Other departments of natural history as well as astronomy, which the discoveries of Newton rendered a favourite science, also occupied a large share of his attention. Having entered into holy orders, he was presented in 1710 to the perpetual cure of Teddington in Middlesex, which, with some other livings, he held till his death in 1761. He had been nominated by George II. to a canonry at Windsor, but declined the acceptance, because, it is said, the necessary duties would have interrupted his philosophical investigations.

Dr Hales having read several memoirs before the Royal society, detailing experiments on the progress of the sap in trees, he published the whole in an enlarged and improved form, under the title of "Vegetable Statics." The other works of Dr Hales, which chiefly relate to practical subjects, are on sea-water, on the preservation of corn, flesh, and other substances, in which useful instructions are given to mariners,—on the ventilation of mines, prisons, and ships,—on the method of winnowing and cleaning corn,—on regulating the heat of melon-frames and green-houses,—and on the method of measuring great depths by means of a sea-gauge. The dissertations on these subjects were either published separately, in the Philosophical Transactions, or in periodical publications. Dr Hales was also the author of several sermons preached on public occasions.

HALESIA, Snowdrop-tree, a genus of plants belonging to the Dodecandria class, and of which a very beautiful species is a native of Carolina.

HALIFAX, a market town of Yorkshire in England, is situated on the river Calder, and surrounded by high hills. A large Gothic church at the east end of the town contains two chapels and has an elegant tower 117 feet in height; and a splendid new church has been recently built. The population in 1811 amounted to 9159. Woollen, cotton, and other manufactories are very extensive. The manufacturers have a spacious edifice called the Cloth or Piece Hall, where great quantities of goods are exposed for sale; and the navigation from Sowerby bridge is highly advantageous to trade. Free-stone is sent in great abundance from Halifax to London.

HALIFAX, a maritime town, and the capital of the province of Nova Scotia, belonging to the British, is situated on an eminence on the spacious bay of Chebucto, and is about two miles in length, and entrenched with forts of timber. The streets intersect each other at right angles, and the houses are arranged in oblong squares. The harbour is very extensive, and the naval yard is well supplied with stores. The principal export is fish; great abundance of which is obtained round the coast. Considerable trade is carried on with the West India islands. The population amounts to about 8000, though some have stated it as high as 15,000.

HALIOTIS, Ear-shell, a genus of shell-fish. See Conchology.

HALLE, a town of the dutchy of Magdeburg, belonging to Prussia, is seated on a fine plain on the banks of the Saale. The cathedral, some hospitals, and the university are the principal public edifices. A great deal of salt is extracted from copious salt springs in the vicinity; a printing-office furnishes a very large impression of the bible; and the other manufactures are woollen, linen, and silk stuffs, with porcelain and leather. The population is estimated at 20,000.

HALLER, Albert Von, an illustrious physician, and voluminous writer, was born at Berne in Switzerland in 1708. From his earliest years he discovered an uncommon capacity for the acquisition of every branch of knowledge, and, with such talents, his progress in learning was extraordinary. He was applying himself to books of deep erudition at that age when other children are only beginning to read, and in his ninth year had learned Greek and was studying Hebrew. After being for some time under a private tutor, he was sent to the public school at Berne, and, in his 16th year, to Tubingen for the study of medicine, from whence, after remaining two years, he removed to Leyden to finish his medical course under the celebrated Boerhaave. In 1727 he visited England, where he became intimate with the most distinguished literary characters, after which he went to France and studied anatomy, and then to Basil, where he prosecuted his studies under the famous Bernouilli.

In his 26th year he returned to Berne, and was appointed professor of anatomy and keeper of the public library, from which, however, he was soon raised by George II. to the anatomical chair of the university of Gottingen, which he filled for 17 years, and during which time he devoted himself most assiduously to the improvement of physical science; and he succeeded by his experiments and discoveries in establishing the philosophy of medicine upon an improved basis, and throwing a new light upon almost every one of its departments. From George II. he was honoured with every mark of respect and attachment, and, while at Gottingen, received many tempting offers of distinguished professorships and honourable offices in the state; but, so zealous was he for supporting in that medical school the fame he had bestowed upon it, that he generously refused to accept them. At last, however, a bad state of health induced him to resign and to return to his native city, where he had a pension bestowed upon him for life, and was repeatedly raised to the highest employments in the state. He died in 1777. His "*Elementa Physiologiæ*" and "*Bibliothcea Medicinæ*" are works which display uncommon study and a most acute and original genius. To Dr Haller many foundations for charity and the promotion of science owe their origin; such as the Anatomical theatre, the School of Midwifery, the Chirurgical society, and the Royal academy at Gottingen, along with the Economical society and Orphan hospital at Berne.

HALLERIA, a genus of plants belonging to the Didynamia class.

HALLEY, Dr Edmund, an eminent English astronomer, was born in London in 1656, was educated at St Paul's school and Oxford, and in very early life directed his attention to astronomy and its kindred studies. His first memoir connected with the mathematical principles of astronomy was published in the Phil. Trans. for the year 1676; and having projected the plan of forming a catalogue of the stars of the southern hemisphere, he was sent out to St Helena under the patronage of Charles II. and arrived in that island in 1677. This production of his indefatigable industry was presented to the public in 1679; and, during his stay at St Helena, he had an opportunity of observing the transit of Venus over the disc of the sun. In 1679 Dr Halley visited Dantzic for the purpose of settling a controversy between Dr Hooke and the Polish astronomer Hevelius; and he spent the greater part of the two succeeding years in France and Italy.

In 1683 he published his "Theory of the Variation of the Magnetical Compass," in which he supposes that the globe of the earth is a great magnet having four magnetical poles or points of attraction; and his attention being directed to Kepler's laws, he applied to Newton, then professor of mathematics at Cambridge, to assist him in settling some points relative to that subject, and the latter communicated to him the theorems which contained his theory of gravitation. Halley was so charmed with the splendour of this discovery, that he persuaded Newton to complete the work, and the Principia was published in 1686, under the superintendence of Dr Halley, who prefixed a discourse and a copy of Latin verses as a eulogium on the illustrious discoverer.

For several years Dr Halley was employed in drawing up various papers on the subject of astronomy and other departments of natural philosophy; and in 1698, having received from King William the appointment of captain in the navy, he set sail in October of that year for the coast of Africa and America, to observe the variation of the compass; but the mutinous conduct of some of his officers, and the sickly state of the crew, compelled him to return to England in July 1699. He sailed again in September following, and in the course of his voyage visited some parts of the coast of Africa, Madeira, the Canaries, Brazil, St Helena, and Barbadoes. The chart exhibiting the variations of the needle was published in 1701. In the same year he was employed to make a survey of the English channel, and in the succeeding year he was commissioned by the emperor of Germany to give his advice and assistance for the enlargement and repairs of the fortifications of Trieste. On his return to England he was appointed to the Savilian professorship at Oxford, although, a few years before, he was unsuccessful in his application for the professorship of astronomy at the same university, on account, it is said, of his infidelity in religion, and it is not understood that any change had taken place in his opinions. But he had no sooner received this appointment than he commenced the translation of the Conics and some other mathematical treatises of Apollonius. In 1719 he was appointed astronomer-royal, and, although at an advanced age, he continued, with the most indefatigable industry, for 20 years, to make astronomical observations. He died at Greenwich in 1742, and left behind him a character for ingenuity and industry which has been rarely equalled. He wrote also on the diving-bell and on the method of finding the longitude at sea, and his astronomical tables were published in 1749.

HALO, or CORONA, a luminous circle which sometimes appears round the body of the moon or stars, and occasionally exhibits the prismatic colours. The cause of this appearance has been variously ascribed by philosophers to the rays of the sun refracted through flat stars of transparent ice; to particles of hail of a globular or cylindrical form, and having an opaque nucleus in the centre; to rays of light refracted by floating hail or snow, or to certain modifications of these different causes. See METEOROLOGY.

HALORAGIS, a genus of plants belonging to the Octandria class.

HALSTEAD, a town of Essex in England, situated on an eminence near the river Colne, had formerly a considerable trade and manufactures of woollen stuffs, and the population in 1811 amounted to 3279.

HALTERES, or POISERS, two small round bodies supported on stalks and attached to the body of dipterous flies, as in the Tipula genus. Some naturalists suppose them to be the rudiments of another pair of wings.

HAM, a town of Westphalia in Germany, is situated near the confluence of the rivers Asse and Lippe, was formerly one of the towns belonging to the Hanseatic League, and has been long celebrated for the superior quality of the hams, which are known by the appellation of Westphalia hams,—for its linen manufacture, and for a peculiar kind of beer.

HAMADRYADES, from the Greek, signifying *connected with the oak*, were certain fabulous divinities which as the ancients supposed inhabit oaks and preside over woods and forests.

HAMAH, a town of Syria, and supposed to be the *Apamea* of Strabo, stands in a narrow valley on the banks of the Orontes, is about 100 miles east from Tripoli and nearly the same distance north from Damascus, is celebrated for its water-works, by which water is raised and conveyed to fountains, gardens, and public baths, and contains a population of about 4000, some of whom are occupied in the manufacture of linen.

HAMAMELIS, WITCH HAZEL, a genus of plants belonging to the Tetrandria class.

HAMBURGH, a city of the duchy of Holstein in Lower Saxony in Germany, is situated on the north of the river Elbe, in east longitude 9° 26′, and north latitude 53° 36′, is divided into the old and new town by means of a canal, and surrounded by a spacious rampart and broad ditch. It is washed on the east by the river Bil and on the north by the river Alster, which forms two large basins; and on several islands formed by the Elbe and Alster, and connected by 84 bridges, part of the city is built. The town is extensive, and the principal streets have long and broad canals. The houses are built in the Dutch style, and to the height of six or seven stories; and, owing to their contiguity to the water, and the frequent inundations of the river, the upper parts of the buildings are occupied as warehouses. The principal buildings are the cathedral, several Gothic churches, an Orphan and other hospitals, the Exchange, and an obelisk in honour of professor Busch; and, as a curiosity, may be noticed the *raths-keller*, or town-cellar, a large subterraneous cavern, having several halls and chambers where entertainments are given and abundance of Rhenish wine is stored.

Hamburgh, besides its importance in point of commerce, possesses numerous literary institutions, valuable libraries, cabinets of natural history, and collections of paintings and prints, and can boast of many eminent literary characters, among whom Lessing and Klopstock shine conspicuously. The chief amusements are music, dancing, and gaming, in winter, and in summer the principal resort is to the public gardens. A French and German theatre, and musical drama or opera, are established in the town, the latter of which has been long encouraged; and the talents of Handel and some other great masters were first known in this city.

The population of Hamburgh fluctuates from 110,000 to 120,000. The city is governed by the senate and three colleges of burghers; the police is well regulated and efficient; and as the establishments for the poor are numerous, few or no beggars are found on the streets. The citizenship is personal, and strangers who do not purchase the citizenship pay a stipulated sum for liberty to engage in trade. The aggregate revenue is estimated at L.285,000 sterling.

The principal manufactures are velvets and silk stuffs, laces, metal-buttons, stockings, and sail-cloth, together with sugar-refining, calico-printing, and dyeing. The situation for trade is peculiarly favourable; the Elbe forms a good harbour, and is navigable for large vessels to within four miles of the town, and by means of the canals goods are brought to the doors of the warehouses. The commerce consists in the exportation of manufactured produce, the importation of foreign merchandise, and the re-exportation of these articles to different parts of the continent. Considerable exports of timber are made to France and Spain. After the raising of the blockade of the Elbe, from 1900 to 2000 ships annually entered the port. The vessels belonging to the merchants and employed by them amount to about 400.

The bank of Hamburgh was established in 1619, upon the same principles as that of Amsterdam, and designed as a general fund for the convenience of the merchants, through which payments are made or received by mere transfer in the books. The specie, which consists of dollars and ingots of silver, having no circulation, serves as a standard for valuing other specie, and the fund remains entire. The money of the bank is worth from 15 to 20 per cent more than current money. A new bank was also established in 1725, for the convenience of the town. This bank receives no money but that coined by the city, and the *agio* is regulated by the two banks.

HAMEL DE MONCEAU, HENRY LEWIS DU, an eminent French author on vegetable physiology and rural economy, was born at Paris in 1700. The first of his publications on the economy of vegetables was an "Essay on a Parasitical Fungus which infests the roots of the cultivated Saffron;" and it appeared in the Memoirs of the Academy of Sciences for 1728. His next work related to agriculture, which, it is understood, greatly tended to advance the progress of that art in France. But the greatest production of Du Hamel is his "Treatise on Trees and Shrubs which are cultivated in France in the open air," which first appeared in 1755, in 2 vols. 4to. The "Treatise on Fruit Trees," also in 2 vols. 4to., with coloured engravings, was published in 1768. In this work the author has distinguished with great nicety the different varieties, and has successfully illustrated their mode of treatment. By far the most splendid edition of these works was presented to the public under the patronage of Bonaparte. The appointment of Du Hamel to be inspector of the French marine led him to inquire into those subjects that relate to the cultivation and preservation of timber. Beside which, he wrote on the preservation of grain, on sugar-refining, on the smelting of iron, on the fisheries, and on other economical arts, in all of which his observations and practical directions are highly valuable. He died at Paris in 1782.

HAMELLIA, a genus of plants belonging to the Pentandria class, and named in honour of Du Hamel. The different species are chiefly natives of Jamaica and the other islands of the West Indies.

HAMELN, a town of Hanover, with about 4000 inhabitants. See HANOVER.

HAMILTON, a town of Lanarkshire in Scotland, situated on the banks of the Avon near its confluence with the Clyde, containing about 7000 inhabitants, who are chiefly employed in manufactures connected with Glasgow, from which it is 12 miles distant. The palace, park, and pleasure-grounds of the Duke of Hamilton in the immediate vicinity, and the mansion and ancient castle of the Douglas family at Bothwell, surrounded with extensive woods, add greatly to the beauty of the scenery.

HAMILTON, ANTONY, Count of, a lively writer of memoirs of his own time, was a descendant of a branch of the Dukes of Hamilton, and was born in Ireland about the year 1646. His mother was sister of the Duke of Ormond, viceroy of that kingdom. The civil dissensions of the country compelled his family to retire to France while he was yet an infant, and he was educated in the language and religion of that country. During the reign of Charles II. he made several visits to England, but his profession of the Catholic faith precluded him from any public employment. On the accession of James II. he received the command of a regiment of horse, and the appointment of governor of Limerick; and on the decline of the affairs of that monarch, and his final abdication of the kingdom, he accompanied his master to France, where he died in 1720, when he had reached the 74th year of his age. He was the author of poems and Fairy Tales; but his principal literary production is the "Memoirs of Count Grammont," in which, as Voltaire expresses it, "the most slender ground-work is set off with the gayest, most lively, and agreeable style." The portraits and anecdotes of the most celebrated persons in the court of Charles II., render it peculiarly interesting to the English reader. A splendid edition of this work, adorned with beautiful engravings from original portraits, and in the finest style of typography, was published by the late lord Orford, from his own private press at Strawberry-hill.

HAMILTON, GAVIN, a historical painter, descended, it is said, from a branch of a noble family in Scotland, resided for the greater part of his life at Rome. Most of the subjects on which his fame as an artist rests are taken from the Iliad of Homer. The latter period of his life was occupied in researches for antique monuments, for which purpose he made excavations in different parts of the Roman state, and especially among the ruins of Adrian's villa at Tivoli; and he was successful in his discoveries of busts and statues which have contributed to the progress of the arts and classical learning. As a man, Mr Hamilton was no less distinguished by his benevolence and liberality. He died in 1794.

HAMMERSMITH, a village or hamlet in Middlesex and in the vicinity of London, contains nearly 6000 inhabitants. A great extent of ground in the neighbourhood is under culture as market-gardens, and it is adorned with many elegant seats and beautiful villas.

HAMMOND, JAMES, an English elegiac poet, was born in 1710, educated at Westminster school, and, having procured the friendship of several persons of distinction, he was introduced to Frederick prince of Wales, and received an appointment in his service. An unfortunate attachment is supposed to have affected his mind, and contributed to shorten his days at the early age of 30.

The Love Elegies of Hammond, by which he is known as an author, were published after his death by his friend lord Chesterfield, and have acquired a considerable share of popularity, although they are chiefly composed of translations or imitations of Tibullus, whose finest sentiments he has adorned with much sweetness and elegance.

HAMPDEN, JOHN, a celebrated political character of the 17th century, was born in London in 1594, was educated at Oxford, and afterwards applied himself assiduously to the study of the law. His father's death put him in possession of a large estate, but the commencement of the civil dissensions of the times drew him from his retirement, and, being related to Oliver Cromwell, he attached himself to the party that opposed the measures of the court. In the year 1637 he joined those persons who had determined to go into voluntary exile, by transporting themselves to America, rather than submit to the tyrannical proceedings of the star-chamber. The ship in which they had embarked was prevented from sailing, and soon after Hampden became conspicuous by his refusal to pay ship-money. The decision of the judges was against him, but from his vigorous resistance of that illegal demand he obtained the appellation of *patriot*, and became a leading man of the popular party. He was a member of the long parliament, and in 1640 was selected as one of the five members charged by the king with high treason. The state of affairs now approached to a crisis; Hampden joined the parliamentary army, was appointed to the command of a regiment, and in an early engagement received a shot which in a few days terminated his life in 1643.

HAMPSHIRE, or HANTS, a maritime county of the south of England, bounded on the south by the British channel, on the north by Berkshire, on the east by Surrey and Sussex, and on the west by Wiltshire and Dorsetshire, is of a square form, having a triangular projection at the south-west; extends about 55 miles in length and 40 in breadth, and the superficial area has been estimated at 1,812,000 acres.

Aspect.—Hampshire, from its favourable soil and climate, and the varied prospect of gentle hills and fruitful valleys, together with numerous seats, villages, and extensive downs and woodlands, may be considered one of the finest counties in England. The soil is of a chalky nature but fertile, and the water-meadows are extensive. Towards the centre of the county the lands are higher and more chalky, but less fertile. The best part of the county is inclosed, but great tracts yet remain barren and uncultivated. The richest and most valuable soil is in the vicinity of Alton.

Rivers.—The Itchin, the Avon, the Boldre water, the Exe, the Anton, and the Tese or Test, are the principal rivers. The Itchin rises in the middle of the county, passes Winchester, and unites with the Southampton water about half a-mile east from that town. The Avon enters the county near Fordingbridge, takes a delightful course by the New forest, is joined by the Stour below Christ-church and falls into Christ-church bay. The Boldre water originates from a number of springs in the New forest, and passes Boldre and Lymington in its course to the sea; the Exe rises in the same district, and falls into the sea below Exbury; and the Anton rises in the north-west of the county, and flows through Andover into the Tese, which river has its origin below Whitchurch, and being joined by the Avon takes a southerly course, receives several small streams, and forms the head of Southampton water, which is an arm of the sea extending about ten miles, and navigable for vessels of considerable burden.

The Kennet navigation, leading from Newberry to Reading, has proved advantageous. The Basingstoke canal extends to the river Wey 37 miles; the Andover and Redbridge canal falls into the Southampton water 22½ miles from Andover; and the Winchester and Southampton canal is one of the oldest in the kingdom.

Natural history.—In the cliffs near Hordwell, which rise above 100 feet high, iron ore has been found, chalk is worked at different places, potter's clay at Poolheath, and red sandstone between Milton and Christchurch. Some valuable salt marshes are in the vicinity of Redbridge; and Hampshire possesses several fish ponds, well stocked with carp and tench, which are advantageously disposed of to the London fishmongers.

The county is distinguished for agriculture, and the produce of corn, hops, cattle, wool, bacon, honey, and timber, and the extent and management of the water meadows. The average size of the farms is about 200 acres, and the greatest estate does not exceed L.8000 per annum. A great extent of land is appropriated to the growing of wheat and barley. Oats are generally reared after two or three white crops. Peas and potatoes are very abundant, and turnips are grown to some extent. The cultivation of sainfoin has been long successfully attended to, and the productive hop-grounds at Fareham occupy about 800 acres.

The forest of Alice, Holt, and Woolmer, the forest of Bere, and the New forest, extend over a great part of Hampshire, and furnish a great deal of timber and oak bark. The Cadenham oak is remarkable for the buds appearing in the midst of winter.

Gardening is extensively attended to. The orchards are principally confined to the south and south-western parts of the county, and cyder is not manufactured to any great extent.

Population.—Hampshire is divided into 39 hundreds, containing 253 parishes, and about 1000 villages, and, together with the isles of Wight, Jersey, Guernsey, Sark, and Alderney, is comprehended within the diocese of Winchester, and, exclusive of the isle of Wight, sends 20 representatives to Parliament. The population in 1811 amounted to 245,080.

Manufactures.—The principal manufactures are serges, bombazines, shalloons, silk and cotton goods, and bed-ticks, malt, leather, and bricks and tiles. At Overton are silk and paper mills, at which the paper for the Bank of England notes is manufactured.

Winchester is a very ancient city, standing on the declivity of a hill near the river Itchin, has been much improved of late years, and the houses are disposed in parallel streets, branching off at right angles from the High street, which runs through the centre. Winchester castle, built by William the Conqueror, and the scene of many great transactions, is entirely in ruins except the chapel, now used as the county hall, and in which Arthur's Round Table is suspended at the east end. The city cross in the High street consists of three stories with arches, niches, and pinnacles, and is worthy of notice. The churches and chapels, which were formerly very numerous, now amount to about twelve. The cathedral is a splendid and celebrated Gothic edifice, originally built in the eleventh century, and rebuilt in 1394. Among the other public buildings may be enumerated the town-hall, where the city archives and the original Winchester bushel are preserved; St John's House, originally founded as an hospital; the new county gaol; and a county hospital or infirmary. There are several dissenting meeting houses; and a Roman catholic chapel is worthy of notice. Winchester college occupies a considerable space, has a venerable appearance, the interior of the chapel is richly ornamented, and the cloisters to the southward are now occupied as a library, and, besides some rare books, contains many curiosities. The city is governed by a mayor, recorder, and aldermen, and the population is about 6000. Winchester is 63 miles south-west from London.

Southampton is situated on an eminence between the rivers Itchin and Test, so that it is nearly surrounded by water; contains six parishes, and the town consists of one spacious street with smaller branches. The houses are well built, and among the public buildings may be noticed five parish churches, the audit house, the assembly-rooms, and the theatre. The town-hall is situated above the bar-gate, which is the main entrance to the town. Little of the ancient castle now remains, but the view from its situation is very pleasing. The town also contains a grammar school, two hospitals, an alms-house, and schools of industry, and the barracks occupy about two acres of ground. The population in 1811 amounted to 9617, and silk and carpets are the principal manufactures. Southampton was formerly a place of commercial importance, but trade is now less considerable. The market is very commodious. The favourable situation of Southampton for sea-bathing, together with the celebrity of a chalybeate spring in the vicinity, has occasioned its being much frequented of late years; and the town has in consequence undergone many improvements. The springs in the neighbourhood yield a plentiful supply of fresh water. The distance south-west from London is 75 miles.

Portsmouth is an ancient sea-port town on the island of Portsea, celebrated for its naval establishment, and rendered almost impregnable by its situation and regular fortifications. The government works are very extensive, and the military and naval stores are kept in the best order. The rope-house is about a quarter of a mile long, some of the cables require 100 men to work them, and the docks and yards have the appearance of distinct towns. The harbour is very spacious, well fortified, and capable of receiving the whole English navy.

The town is very extensive, and the new town, built on Portsmouth common, which has risen to importance, is denominated the Town of Portsea. Among the public buildings of Portsmouth and Portsea, may be noticed two parish churches, besides chapels and different meeting-houses for dissenters, the custom-house, the theatre, the town-hall and prison, situated in the High-street, and the poor's houses. Portsmouth is governed by a mayor, recorder, and aldermen. The population, including Portsea, amounted in 1811 to 40,567. The commercial intercourse is very considerable; an annual fair is kept, and the markets are well stored with provisions. Several breweries are established. From the want of aquæducts or reservoirs, the inhabitants are daily supplied with water in carts. Portsmouth is 27 miles south from Winchester.

The isle of Portsea, which is about five miles long, and between three and four broad, is separated from the mainland by a narrow channel on the north; the communication is by means of two bridges; and, besides the towns of Portsmouth and Portsea, contains many extensive villages.

Andover, an ancient town, which still bears the traces of Roman encampments, and near which is the Roman road from Winchester to Cirencester, is situated on the great western road to Exeter and Plymouth, and has a spacious church, a town-hall, and free school; the population is above 3,300; and some trade is carried on in shalloons and malt. It is 65 miles west from London.

Lymington is a small town on the west bank of the river of that name, where many Roman coins have been discovered, has been long famous for salt-works, of which 40 now only remain. Though the situation is good the trade is inconsiderable. The population is between 2000 and 3000. It is 17 miles south-west from Southampton.

Christchurch is situated between the Avon and the Stour; contains a population of about 1500, and the salmon-fisheries, two breweries, the making of watch-spring chains, and the knitting of stockings, principally occupy the industry of the inhabitants. The church, which is an elegant structure, the altar-piece of which is very curious, is the most interesting object. The bay or harbour admits small vessels, and, together with the port of Poole, in Dorsetshire, is remarkable for every tide producing two high waters.

Petersfield is a market town situated on the high road to Portsmouth, and principally supported by the passage of travellers. The population in 1801 is stated at 1159.

Stockbridge is a market town on the east side of the Test, consists of two ranges of houses, and depends on the passage of travellers from Winchester to Salisbury. The population in 1801 was 642.

Whitchurch is a straggling town situated at the chalk hills. The population in 1801 amounted to 1275, and agriculture and the woollen trade occupy the inhabitants.

Besides those already noticed, may be enumerated the towns of Basingstoke, Ringwood, Fordingbridge, Romsey, Gosport, Fareham, Havant, Odiham, Alton, and Arlesford.

Isle of Wight is included within the jurisdiction of Hampshire, is separated from it by the Solent sea, a channel varying from two to seven miles in breadth, and is nearly 23 miles in length and 13 in breadth. The superficial extent is stated at 105,000 acres.

The face of the country is agreeably diversified. A range of high hills extends through the island, affording excellent pasturage, and commanding delightful prospects. Round the coast, and particularly towards the south, the land is high, and the cliffs are precipitous; on the north the ground slopes gradually, and on the west are ridges of rocks about 600 feet above the level of the sea, and from their sharp points are called the *Needles*.

The Medina, the Yar, and the Wooten are the principal rivers, the latter of which divides the island into two equal parts. There are also several small streams, and various creeks and bays.

Fossils and shells are very abundant in the cliffs; the cornu ammonis is found in size from one inch to a foot and a half in diameter; and free-stones, fuller's earth, ochre, native alum, micaceous sand, native sulphur, copperas-stones, and pipe-clay are very plentiful.

The climate and soil are peculiarly favourable; grain, turnips, clover, rye-grass, and potatoes are grown abundantly, and the luxuriant vegetation of the island has suggested the appellation of the *Garden* of *England*. The woods of Swainston, Wooten, and Quaar are of considerable extent. Carisbrooke forest is now nearly destitute of trees, owing to the demand for timber at Portsmouth and other yards. Various kinds of marine birds resort to the cliffs; game is abundant, and great quantities of fowls are bred. Different kinds of fish are found on the coast, of which the lobsters, crabs, and cockles are in much estimation. Some chalybeate springs have been discovered, and the springs of fresh water are very pure.

The population in 1802 amounted to 22,602. The island is divided into two hundreds, or East and West Medina, which contain 30 parishes; and the three market towns are Newport, Newton, and Yarmouth, each of which sends two members to parliament.

The harbour of Cowes is well situated for the shipping, and the trade is prosperous. The principal manufactures are starch, hair-powder, salt, and woollen stuffs. The exports are wheat, flour, barley, malt, and salt, for which coals, iron, wine, hemp, and timber are imported.

Newport, situated in the centre, is the principal town of the island, consists of five parallel streets, and three others crossing at right angles, and possesses one parish church, a town-hall, a grammar-school, a house of industry, a theatre, and assembly-rooms; and a philosophical society has been established. The situation of Newport is pleasant and favourable for trade; it is well watered, and the population in 1801 amounted to 3585.

Newton, which was formerly a place of some importance, consists of about ten villages, possesses a good haven, and Hampsted farm on the west side of the river is very extensive.

Yarmouth, a small town on the east of the river Yar, has some commercial intercourse, and the population in 1801 was 343. The castle is situated at the west end of the town.

West Cowes is a populous village delightfully situated on the west side of the Medina, and much frequented for sea-bathing; a castle is situated at the entrance of the harbour, the places of worship are numerous, and trade is extensive.

East Cowes, on the east side of the Medina, is a place of some trade, and a custom-house has been built: The castle, situated on a neighbouring hill, has a fine appearance.

Ryde is divided into upper and lower. Lower Ryde along the shore is inhabited by sea-faring people, and much frequented for bathing. Ryde is the principal thoroughfare between the Isle of Wight and Portsmouth.

Carisbrooke, formerly the capital of the island, has a population of about 2000, and is principally noted for its church and ancient castle.

HAMPSHIRE, NEW, one of the United States of America, has for its boundary on the north Lower Canada, on the south the state of Massachusets, on the east the Atlantic ocean, and the state of Maine and the river Connecticut on the west; stretches from north to south 160 miles, while it varies in breadth from 90 to 19 miles, and covers a surface of more than 600,000 acres.

Aspect.—The shores of New Hampshire, extending about 20 miles, present a sandy beach, contiguous to which are numerous salt marshes, which are in different places intersected by creeks; for the distance of 30 miles inland the surface is finely diversified with hill and dale, and is succeeded by several mountainous ridges, some of which rise to a greater elevation than 4000 feet. In one of the mountains of the southern range indications of volcanic operation, in the explosions that were heard, and the smoke and flame that issued from it about 1732, were observed.* The soil is rich and fertile, and near the banks of the rivers affords luxuriant crops of grain, while the elevated districts furnish excellent pasturage.

Lakes and Rivers.—The Winnipiseogee, the largest lake within the boundaries of the state, is 24 miles in length, and varies in breadth from three to 12 miles; and several other lakes of inferior extent discharge their waters into the different rivers. The river Merrimac has its source in the loftiest range of mountains, and after receiving several tributary streams, and the waters of some of the lakes, and running a course of 100 miles, joins the sea at Newbury port. To avoid the falls, and to facilitate the navigation of this river, canals have been formed. The Piscataqua, after a course of 50 miles falls into the sea two miles below Portsmouth; and six miles above the same town it is crossed by a magnificent bridge of 2600 feet in length, which is chiefly constructed on piles, and has a grand arch of 244 feet span. The Connecticut receives in its course the waters of several considerable rivers, and of some lakes.

Population, &c.—The number of inhabitants, which in 1767 was estimated at 52,000, had increased in 1810 to more than 214,000. The principal manufactures are woollen and linen stuffs, pot-ashes, maple-sugar, iron smelting, brick-making, and pottery; and the trade in exports consists of fish, whale-oil, tar, flax-seed, corn, horses, cattle, and sheep; and the imports are chiefly West India produce, cotton, cheese, porter, wine, and hard-ware. The inland commercial intercourse is greatly improved by canals and river navigation.

New Hampshire is divided into six counties; and the principal towns are Portsmouth, Concord, Dover, Dartmouth, Durham, Exeter, Amherst, Keene, Charleston, and Haverhill.

Portsmouth, the largest town of the state, is situated on the south bank of the river Piscataqua, about two miles distant from its junction with the sea. The harbour has a sufficient depth of water for ships of any magnitude. The state-house, work-house, and several churches are the chief public buildings, and the population is about 7000.

Concord is a pleasant town situated on the west bank of the Merrimac, and contains about 2,400 inhabitants.

Charlestown is finely situated on the Connecticut, and consists of one street, with 1500 inhabitants.

Dartmouth, which is 36 miles distant from Charlestown, stands on an elevated plain about half a mile eastward from the banks of Connecticut river, and includes a population which exceeds 2000. The college of Dartmouth, which was instituted in 1669, is well endowed, and has professors of divinity, natural philosophy, chemistry, and medicine, and is attended by more than 200 students.

Haverhill is situated near the banks of the Connecticut, and contains more than 1000 inhabitants; and *Keene*, with more than 1600 inhabitants, occupies a fine situation a few miles to the eastward of the same river. *Dover* is situated between two branches of Piscataqua river, contains more than 2000 inhabitants, and is five miles north from Durham; and *Durham*, which stands on the banks of the Piscataqua, contains 1400 inhabitants. *Amherst* is 22 miles south from Concord, and the population exceeds 1500. *Exeter* is situated on a branch of the Piscataqua. The harbour admits vessels of 500 tons; the population exceeds 1000; and a thriving academy established in 1781 is attended by more than 70 students.

Isles of Shoals.—The isles of shoals, which are about nine miles distant from Portsmouth lighthouse towards the south-east, are about eight in number, and belong partly to the state of New Hampshire and partly to Massachusets. They consist chiefly of bare rocks, but from the conveniency of fishing were occupied before the American war by more than 600 inhabitants. The population has now diminished to 100, and the business of fishing is the chief object of their industry.

HAMPSTEAD, a village of Middlesex, about four miles north-west from London, stands on an elevated situation which commands an extensive prospect of the metropolis and the surrounding country, was formerly much resorted to on account of its mineral waters, and is now chiefly inhabited by citizens of London.

HAMPTON, a town of Middlesex, is situated on the banks of the Thames, about 12 miles west from London, and is chiefly remarkable for the royal palace which was built by Cardinal Wolsey, and furnished by that ambitious prelate in the most magnificent manner. It became a favourite residence of King William, and the buildings, gardens, and parks were greatly improved by that monarch.

HANAU, capital of the county and principality of Hanau Munzenberg, is situated on the river Kentzig, where it joins the Mayne, and is divided into the old and new town, has a palace and several churches, contains 11,000 inhabitants, who are occupied in the manufactures of stockings, tobacco, pottery, playing cards, and hardware.

HANDEL, George Frederick, the prince of modern musicians, was born at Halle in Upper Saxony, on the 24th Feb. 1684. His fondness for the art in which he was destined to attain such eminence appeared in very early life, and assumed so much the character of an overpowering propensity, that it was discouraged by his father, a respectable physician, who had planned out for him the study of the law as a profession. But strong original genius is rather stimulated than overcome by difficulties. Young Handel found means, in spite of the prudential restrictions and prohibitions of parental authority, not only to gratify his *ear*, but also to acquire considerable practical knowledge in music. His own voice afforded a pleasure which was surpassed only by what he derived from some performances on a harpsichord, to which he had got access, notwithstanding the rigorous caution exercised over him; and he had moreover contrived to possess himself of a similar instrument, which he secreted in an attic room, whither he retired on every possible opportunity, and particularly when the family had gone to rest. Common report, after the establishment of his fame, assigned an almost miraculous advancement in the science, as well as in the art, of music, to his unassisted and unsanctioned efforts; but without allowing full credit to all the stories that have been related of him, enough is positively known of his juvenile history to give the highest opinion of his enthusiasm and industry. Their effects were signally manifested before he had attained the eighth year of his age, and decided even his father to consent to a species of instruction, against which, every idea of expedience, and every feeling of pride or family honour, had previously been directed. An incident deserves notice as a turning point in the lot of this singular individual.

Dr Handel, who had a son by a former marriage then residing as a valet-de-chambre with the Duke of Saxe-Weissenfells, resolved to visit him at the court of that prince. He was accompanied by George Frederick, whose entreaties and tears ultimately prevailed over the purpose of the old gentleman to leave him at home. The young musician, who had soon found his way to the concert-room of the duke, and as soon placed himself before a harpsichord in it, was emboldened one day, on the conclusion of religious service in the chapel at which the duke attended, and just before his departure from it, to venture towards the organ, which he touched in so unusual a manner as to draw forth inquiry on the part of his highness respecting the performer. Admiration and surprise were the natural emotions, on learning his age; and these were followed by urgent persuasions to the father to concur in the culture of powers so singularly promising. Returning home, therefore, the little prodigy was placed under Zachau, organist of the cathedral at Halle, from whom he received instruction in the general principles of music, and with whom he had ample opportunity of becoming acquainted with the chief productions of the most eminent composers. His genius keeping pace with the enlargement of his information, displayed itself in a variety of pieces, which testified at once his extensive acquired knowledge and his originality of conception. At the age of thirteen he had realized all that his master could teach him; and he therefore resolved to visit Berlin, which promised him some additional advantages. He went there in

1698, and gave such indications of ability as to procure the patronage of the king, who proposed sending him for a time to Italy. This offer he declined at the advice of some of his friends, and he therefore returned to Halle. The death of his father, soon afterwards, made another change in his prospects. Several places presented inducements to him; but his choice at last lighted on Hamburgh. Here he succeeded in an arduous and nearly fatal contest for the directorship of the opera; and during a residence of nearly three years, in which time he composed three of his operas, Handel fully justified the opinions which had been entertained of his musical talents.

At the invitation of the prince of Tuscany he then set out for Italy. At Florence he delighted that prince with a new piece, for which he received a handsome present; he next visited Venice, where another opera of his composition was applauded during twenty-seven nights' performance; at Rome, whither he afterwards proceeded, he had the felicity to be introduced to those illustrious masters of the art, Corelli and Scarlatti, the former of whom he is reported to have puzzled with a piece of music, and the latter acknowledged his superiority on the organ; he subsequently went to Naples; and having thus extended his fame, as well as gratified his curiosity, if not improved his genius by inspiring the air of this classic region, he returned to Germany. The relation which Sir John Hawkins gives, on Handel's own authority, of the manner in which he was received at Hanover by the truly erudite and singularly accomplished Steffani, who then held the office of conductor of the elector's band, furnishes an interesting specimen of the amiable spirit of that master, while it proves the gratitude and modesty of Handel. "When I first arrived at that city," said he, "I was a young man, under twenty. I was acquainted with the merits of Steffani, and he had heard of me. I understood *somewhat* of music, and could play *pretty well* on the organ. He received me with great kindness, and took an early opportunity to introduce me to the princess Sophia and the elector's son; giving them to understand that I was (as he was pleased to call me) a virtuoso in music. He obliged me with instructions for my conduct and behaviour during my residence at Hanover; and being called from the city to attend matters of a public concern, (Steffani, it will be recollected, was a statesman as well as a musician) he left me in possession of that favour and patronage which himself had enjoyed for a series of years." It is delightful to find the commonly supposed jealousy of musicians belied or reproved by such exhibitions of liberal feeling. Handel, now engaged in the elector's service, had a strong desire to visit England; but he could not do so without permission, which was at length procured for him by Baron Kilmansegge, whose friendly behaviour to him on this and other occasions deserves distinct commendation. His visit, which took place in 1710, occasioned very pressing temptations to establish himself in London, which he at this time resisted. He returned to Hanover, whence, at the end of two years, he again came over to England, about the time that the treaty of Utrecht was in progress. At the suggestion of the British court, he prepared a *Te Deum* and *Jubilate*, for the consummation of the peace; and, by so doing, he incurred the displeasure of his sovereign, who, as well as his whig partisans, it is well known, had sundry reasons for preferring a prolongation of the war with France. On the accession of that prince to the British throne, in the year 1714, Handel experienced the consequences of his compliance, the new sovereign weakly testifying, by an unworthy neglect, his indignation at the politico-musical delinquency of the modern Orpheus. Royalty was afterwards conciliated through a happy device of the nobleman abovementioned, which indeed could scarcely have failed though even more obdurate ears had been exposed to its syren agency. The performance of his fine *water-piece*, during a pleasure-party on the Thames, of which the baron gave Handel timely notice, excited in the king a desire to see, and a disposition to forgive the venial offender.

The establishment of Handel in England, which succeeded this restoration to royal favour, is identified with the most important part of his life, and perhaps the busiest, though, it is to be lamented, not the most honourable period of the progress of music in this country. The chief events connected with it must be elsewhere sought for. Suffice it to say here, that while they drew forth several of those productions which have immortalized his name, they exposed him to vexations and trials under which any ordinary spirit must have irredeemably sunk. Their effects on his temper, his intellect, and his health, were necessarily injurious, and left him at one period a pitiable example of disappointed hope and complicated afflictions. That mind which had created, with a seemingly boundless range of application to human sympathies, a new world of harmony, was become the victim of fretful imbecility,—and that hand, from which an electric power had so often rolled over a willingly subdued audience, was paralysed to more than childish uselessness. In this deplorable condition he was advised to try the vapour-baths of Aix-la-Chapelle, whither he was accordingly conveyed. The recovery thus accomplished was quite unexpected, and bore less the aspect of an ordinary occurrence than of a miraculous interposition, to which, though he was in their estimation a heretic, it was ascribed by the inhabitants of that city, when he one day suddenly astonished them by a performance on the organ of their great church. He afterwards returned to England, and for a short time resumed those theatrical struggles which had already been nearly fatal to him; but they again proved unprofitable, and he prudently resolved on devoting his future labours to the cultivation of sacred music, in which he had already, on some occasions, successfully tried his genius. His far-famed oratorio, the *Messiah*, was performed, for the first time, at Covent-Garden theatre, in the year 1741; but met with a reception which Handel himself, in the far-sighted confidence of real talent, was so convinced to be unjust that he would not suffer it to be final. He appealed to another audience, that of Dublin, whose very different judgment must be allowed the high merit of having anticipated the general verdict of an admiring posterity. *Samson* followed, with an applause which shewed that the London critics were determined not to seem insensible to the merits of this great composer. They compared it, as well they might, to one of the finest productions of Shakspeare or Milton in poetry.

A relapse of his disorder induced Handel to have recourse a second time to the baths of Aix-la-Chapelle, which again proved so serviceable that he was soon able to return to England, and recommence his oratorial compositions. These were great and numerous, as witness the *Occasional Oratorio, Judas Maccabæus, Joseph, Joshua, Jephtha,* not to mention several other productions, which, though quite sufficient to confer ordinary celebrity, are not ranked amongst his most felicitous efforts. All of these were brought out between 1744 and 1751. In this last year he became afflicted with a disorder in his eyes, the nature of which, especially as it did not yield to the means used to relieve him, tended greatly to depress his spirits. It continued to increase, and at last so completely impaired vision, that he found himself unable to conduct his oratorios, though he persevered in attending them, and would frequently touch the organ with a precision and taste which more than reminded the audience of his former excellencies. His appearance on these occasions, but particularly when he was helped towards the front of the stage to thank the public for their patronage and favour, has been described as singularly affecting. The loss of his sight entailed evils against which he made but an ineffectual struggle; and about the beginning of 1758 his appetite, which had always been excellent, as well as his bodily health, which had usually been good, rapidly declined. He died on the 14th April of the following year, in the 76th year of his age, and was buried in Westminster abbey, where a monument, designed by Roubiliac, was erected to his memory.

Some of the peculiarities in the character of this very great man, together with his confined education, his broken English and foreign pronunciation, furnished the materials as well as the occasions of numerous anecdotes. The gratitude, and, it may be added, the high-mindedness, of the country which he had delighted by his performances, and on which a new lustre was thrown by the naturalization of his works, might have been expected to insure a degree of tenderness towards his failings of temper and habits; but assuredly, whatever these were, they will not be allowed to influence the judgment of after times as to the transcendent merits of his productions, which have been so often extolled, that the language of encomium has been exhausted; and, consequently, a very arduous difficulty is imposed on any one who volunteers to speak of them anew. To call them grand, sublime, delightful, is to exercise no discrimination, and to confer no praise. Besides, in order to judge of Handel as a composer, it is necessary to hear his works performed on the large scale, for which, in general, they were intended. Opportunities of this kind are of rare occurrence; and, perhaps, there is scarcely one man living who has witnessed justice done to the whole of them. This of course implies inferiority in some of these productions, as it is evident, that were they all equally excellent, there would be no reason for the preference so frequently awarded. But let no man, in speaking of this implied inferiority, imagine it to consist in reference to any other standard of musical excellence than Handel himself; or that those productions to which comparatively little attention has been extended, are on that account unworthy of commendation. The fact is, the fertility of Handel's invention was fully commensurate to his skill in the science of harmony, and both were in perfect subservience to a very comprehensive intellect and refined taste. It may therefore fairly be said of him, as Dr Johnson has said of Goldsmith, "*nullum quod tetigit non ornavit,*" that he never treated of a subject which he did not adorn; and, consequently, even the least esteemed of his productions possesses a distinct and a peculiar value. Their varied qualities, while they demonstrate the astonishing versatility of his powers, furnish adequate topics of comparison with the happiest efforts of the greatest masters in this divine art; but the existence of them in one mind, the exemplification of them in one piece, is a phenomenon which former ages could not have conceived to be possible, and to which, it is certain, no parallel has been found since his time. It is not denied that the world of harmony has been explored beyond the extent of his practical knowledge; that the powers of certain instruments have been employed with an effect which he had not contemplated; and that some of the offspring of a few favoured individuals justly claim affinity with his original genius. But it is contended, that what he knew, which was all that his contemporaries possessed, he wielded with a facility, a freedom, and a pointedness of adaptation, which have scarcely been equalled by any of his successors; that the performance of his chief works, with such instruments as those to which he confined himself, and in the manner which he himself prescribed, produces effects on an audience which may indeed be occasionally heightened by the introduction of more modern agents, but which cannot be surpassed by those resulting from any other productions under the very highest advantages as to execution; and that, consequently, he is fairly entitled to be considered what we have called him, the prince of modern musicians. The very remarkable expression of Haydn, who alone, it is conceived, can be presumed to be his rival, is no less a correct admission of this truth, than a trait of his own honourable character. It is recorded in the letters of M. Bombet, lately published, which contain so many interesting particulars respecting that eminent man, and will very properly conclude the present sketch. "You know that, while in London, Haydn was struck with Handel's music; he learned from the works of the English musician the art of being majestic. One day at Prince Schwartzenberg's, when Handel's *Messiah* was performed, upon expressing my admiration of one of the sublime chorusses of that work, Haydn said to me thoughtfully, "This man is the father of us all."

HANG-TCHOU-FOO, the capital of the province of Tche-kiang in China, stands on the banks of a river, about 60 miles from its junction with the sea, and is one of the greatest commercial cities of the empire. The population is said to be equal to that of Pekin, which is estimated at three millions; and the principal streets are occupied with shops and warehouses, many of which are equally splendid with those of London. The lake of the same name in the vicinity is much celebrated for its natural and artificial beauties, the picturesque scenery of the surrounding mountains, and the valleys covered with the finest trees, among which the camphor tree finds a place.

HANNIBAL, a celebrated Carthaginian general, who became a formidable rival of the best Roman commanders; and in one of his expeditions fixed the seat of war in the Roman territory, and by his bravery and skill obtained a complete victory. See CARTHAGE.

HANOVER is a small kingdom of Europe, situated near the north-west corner of Germany, and surrounded by the kingdoms of Prussia, the Netherlands, and part of Denmark, and forming a part of what was formerly called the circle of Lower Saxony. It is bounded on the north by Holstein, the territory of Hamburgh, and the duchy of Mecklenburgh, from all which it is separated chiefly by the river Elbe; on the east by Prussia and the duchy of Brunswick; on the south by part of Prussia, and the grand duchy of Hesse; on the north-west by the North sea; and on the west chiefly by Oldenburg and the kingdom of the Netherlands. The extent is not easily ascertained; but by the latest admeasurements it appears to include about 10,931 square geographical miles.

General divisions.—This kingdom comprehends several subdivisions, which were formerly independent states; especially the principality of Luneburg, the arbishopric of Bremen, and the duchy of Verden, on the south side of the Elbe; the duchy of Saxe-Lauenburg, on the north side of the same river; the principalities of Calenburg, Gottingen, and Hildesheim, the circle of Meppen, and the counties of Diepholtz and Hoya, nearly in the middle; the principality of Grubenhagen in the south; and the principalities of East Friesland and Osnaburg, with the county of Lingen on the west. These districts are again subdivided into bailiwicks.

Face of the country.—Considering the smallness of its extent, Hanover presents a great diversity of surface. In its general outline it is very irregular, and abounds with marshy and sandy plains, intersected by tracts that are hilly and even mountainous. The central and northern parts of Luneburg are sandy and heathy, but the borders of the rivers are fertile marshes. The high lands of Bremen are heathy pastures, and the low marshy fields or plains, exposed to inundations from the rivers. Most of Verden is elevated, dry, and heathy, while Saxe-Lauenburgh lies low, and is in general fertile. Calenburg and Gottingen are in some parts hilly, in others low and marshy or sandy, and have much land that is waste or unproductive. The northern parts of Hildesheim are hilly and covered with forests, and much of the rest is rich and fertile ground. Diepholtz contains much land fit for pasture, but Hoya is flat and sandy, with numerous bogs and morasses, and Meppen is almost entirely one barren sandy waste. Grubenhagen is chiefly mountainous and woody, with a few patches that are level and fertile. East Friesland, like all districts that have been won from the sea, is a marshy boggy country; Osnaburg consists chiefly of barren heathy land, and Lingen partakes of both these characters.

Mountains.—The principal mountains of Hanover are the Hartz, situated chiefly in the principality of Grubenhagen. They form a semicircular chain, steep on the south, and having a gentle declivity on the northern side. Two parts of this chain, called the great and little Brocken, are of considerable height, the former being above 3000, and the latter more than 2700 feet above the level of the sea. These mountains abound in mineral products, and give rise to some small streams. Their sides and summits are well clothed with wood, constituting the great Hartz forest.

Rivers.—Besides the Elbe, which, as forming the chief northern boundary of the kingdom, and flowing between two of its principal divisions, may be said to belong to Hanover, this country is traversed by two other considerable rivers, the Weser and the Ems, and has several smaller streams, some of which are navigable, especially the Aller, Leine, and Ildenau. The course of the Elbe has been described under ELBE. The main stream of the Weser runs through the kingdom, first in a westerly, then in a northerly, and, lastly, in a north-westerly direction, till it forms a large estuary with the waters of the North sea, receiving in its course the tributary streams of the Aller and the Leine. It is subject to frequent overflowings, by which the adjacent country is often inundated, and converted into a groupe of islands. The Ems rises in Munster, and runs northerly through East Friesland, till taking a westerly direction it falls near Embden into a large inlet of the sea called the Dollert.

Lakes and canals.—Only two or three small lakes are found in Hanover. The most considerable of them is the lake of Diepholtz, called also the Drummer Zee, which covers a pretty large space, but is extremely shallow. As the Elbe, Ems, and Weser are navigable throughout their Hanoverian extent, there is little occasion for canals, and scarcely any deserve that name except some in East Friesland.

Soil and climate.—From the observations already made, it has appeared that much of the soil in Hanover is sandy and barren, while some other parts consist chiefly of alluvial land, which, were it properly drained, would admit of high cultivation. The most fertile parts of the country are found in East Friesland, Saxe-Lauenburg, and a small district called Land Hadeln. The climate in general resembles that of England, being moist and variable. The winters are usually severe, and rendered unpleasant by the prevalence of north-west winds, while, as with us, the east wind blows commonly in the spring, and the south-west prevails in summer. The most frequent diseases are catarrh, rheumatism, consumption, and intermittent fevers; but in the heats of summer dysentery is so common as sometimes to become a dangerous epidemic.

Natural history.—Of the natural productions of this kingdom its minerals are the most important.

They are very numerous, especially in the Hartz mountains, in which mines of silver have been worked for nearly 900 years; and copper, lead, iron, zinc, manganese, and cobalt are also met with. The average produce of these mines amounts annually to nearly 1,800,000 rix dollars; and one lead mine, the Caroline, is said to yield yearly above 190,000 rix dollars. Much sulphur is of course obtained, and coal and limestone, especially the latter, are found in great abundance. Boracite is obtained from the hill of Kalkberg, and slate and granite from the Hartz. Insulated blocks of granite, embedded in the sand, are common; marble is occasionally obtained, and good paving stones are procured from the mountainous regions. Of the mineral springs, the most celebrated are the hot baths of Limmer, which are much frequented.

The native vegetable productions are not very interesting. Besides the extensive forests of the Hartz, from which abundance of timber both of hard and of soft wood is obtained, several smaller forests occur, especially in Hildesheim, consisting principally of oak, beech, ash, and birch, so that in most parts of the kingdom wood is sufficiently plentiful.

Among the animals of Hanover the domestic quadrupeds are of most importance. Wolves and bears were formerly very common in the forests, but the former are now seldom seen, and the race of the latter has been exterminated. Some deer, and a few wild boars, still occupy their ancient haunts, and hares are plentiful, but rabbits scarce. Of the game, partridges, muirfowl, and a small bird of the same tribe, are the most numerous; and there are also plenty of wild ducks. From the principal rivers and the estuaries into which they flow, are procured pike, carp, perch, large eels, and turbot; and small trout of a delicious flavour are caught in the streams which flow down the sides of the Hartz; but the variety of fish is not great in this country.

Population.—The population of Hanover is variously estimated, some writers computing the whole, including the principality of Osnaburg, at 1,314,124, while others confine it to about 933,000. The principalities of Gottingen, Calenburg, and Luneburg, are the most populous, and the county of Lingen one of the least populous districts. The average population to the square mile is estimated at about 120.

Agriculture.—Except in East Friesland agriculture is not in a state of much improvement in the kingdom of Hanover, not so much from the nature of the soil as from the neglect of the farmers or the conduct of the landlords. In East Friesland and Saxe Lauenburg, where these two classes are on a good understanding, the land is fully cultivated; but in other parts of the kingdom much ground lies waste, and a great deal that might yield good crops of grain is employed in pasture. The consequence of this negligence is, that the inhabitants import grain from other countries. Rye is more cultivated than wheat or barley, but peas, beans, potatoes, and flax are prevailing crops. The land employed in tillage is often very foul for want of weeding, and the pasture lands are not nearly so productive as they might be, from inattention to draining. Many horses are bred in Hanover, and are exported to France, Italy, and Saxony. The cattle are of a middling size, and furnish excellent beef, and the breed has been lately improved by the introduction of bulls from Holland. A great number of sheep is fed on the upland pastures, and they afford delicious mutton. Their wool is coarse, and fit only for the manufacture of inferior cloths. Of late, indeed, Merino rams have been imported, so that there is reason to expect a considerable improvement in that valuable article. Goats are rare, but swine are kept in great numbers, and the pork is much esteemed.

Manufactures and commerce.—The principal manufactures are those of coarse linens, damasks, and inferior woollen cloths, used principally for the poor and in clothing the army. There are also a few manufactories of gunpowder, paper, leather, and glass. In the district of the Hartz are several founderies and forges, at which iron and copper articles of superior workmanship are manufactured. Here also is obtained rock salt, which, when purified and crystallized, is formed into excellent salt for the table. Other manufactories will be noticed under the towns where they are carried on. Until it acquired the possession of East Friesland, Hanover could scarcely be called a commercial country, and its trade was inconsiderable. The principal ports are Embden, Bremen, and Harburg, by means of which, and by way of Hamburgh, it imports various articles of English merchandise, linen from Prussia and Holland, and cloths, cambrics, silks, and jewellery from France. Annual fairs are held at Hanover and Osnaburg for the sale of books, toys, earthen ware, implements of husbandry, handicraft tools, pins, needles, lace, and other articles of dress, bought at the fairs of Leipsic, Frankfort, and Brunswick. The chief exports are horses, cattle, wool, leather, wax, and honey; lead, iron, and copper from the Hartz; coarse linens, oats, and barley. Rye, butter, cheese, fish, wood, and peat are exported from Embden, Pappenburg and Luneburg. Nearly 500 vessels belong to East Friesland.

Constitution and government.—Since the erection of Hanover into a kingdom, its constitution has been in a great measure new modelled, and assimilated to that of Great Britain. The legislative authority is vested in the assembly of the states, composed of three orders, the prelates, the nobility, and the magistrates of towns. This assembly has the privileges of enacting laws, directing the application of the public money, imposing taxes, and guarding the liberties of the subject. The executive power lodged with the king is entrusted to a regency, consisting of seven ministers, at least four of whom reside in the capital, and have the immediate management of state affairs, while one acts as president of the law department, and generally resides at Zell, and another presides over the college of nobles, and holds a court at Stade, as subordinate regent of Bremen and Verden. Besides these, the principalities of Lauenburg, Osnaburg, and East Friesland, have each a subordinate regency, the first holding its seat at Ratzeburg, the second at Osnaburg, and the third at Aurick. To the regency the whole regal power is delegated, subject in particular cases to the sanction of the sovereign.

Laws.—The common law of Hanover is founded partly on the Roman law as explained in the code of Justinian, partly on the constitution of the German empire, of which it was a member, and the edicts of the emperor, and partly on the particular constitution of the individual states which compose the kingdom. The highest judicial court is the court of appeal, which sits at Zell, and is under the superintendance of the law minister, though this president is required in particular cases to consult with the other members of the regency. Capital punishments are said to be uncommon; and breaking on the wheel, which was formerly practised in all its severity, is now never used till after previous hanging. The ordinary punishments are fines, imprisonment, or hard labour in the public works.

Revenues.—The revenues of Hanover are estimated at nearly L.1,000,000 Sterling, and are drawn chiefly from the royal domains, from a land-tax, a poll-tax, and taxes on horses and carriages, mills and leases, licences, various custom and excise duties, especially on imported merchandise, and on cattle, salt, coals and peat, from the postage of letters, and coining of money; but much of it is derived from the Hartz mines, and the produce of the fisheries and forests. The royal revenues are under the direction of a particular treasury board called the hammer.

The effective military force of the kingdom seldom exceeds 23,000 men, of whom about 10,000 are militia. The regular troops include above 6,300 infantry, above 5,000 cavalry, and about 1,300 artillery and engineers. But, besides these effective soldiers, a few invalids are employed in the garrison. All these troops are native, and every officer and man after having served for 20 years, is allowed to retire on a pension proportioned to his rank.

Ecclesiastical state.—The established religion is Lutheran; but there are several Calvinistic congregations, many Jews, and a few Catholics in the country. The whole kingdom contains about 750 parishes, which are distributed under 7 superintendants. The chief ecclesiastical power is lodged with the supreme consistory, which also superintends the different sectaries. The stipends of the established ministers are paid chiefly out of the property taken at the reformation from the catholic churches, and a small allowance in money by government to the dissenting ministers; though of course they are supported principally by their own congregations.

Literature.—The state of literature in Hanover is highly respectable, and the education of youth is conducted on a liberal and extensive plan. Almost every city or large town has its academy, the principal of which is that called *Georgianum*, established in 1796 by George III. for the education of 40 sons of the nobility. In many respects it resembles Eton college, and after a certain term the pupils are sent to the university of Gottingen for three years on a liberal allowance, or receive commissions in the army. The schools are of three orders; primary schools established in every village and small town for teaching the first rudiments of knowledge; secondary schools, where geography, history, the elements of geometry, drawing, and the French and English languages are taught; and academies, which, in addition to these languages, furnish instruction in Latin and Greek, and in antiquities. There is also at Hanover an establishment for instructing those young men who are to act as schoolmasters. But the chief seminary in the kingdom is the university of Gottingen. Hanover can boast of many literary characters of distinguished eminence, particularly Mosheim and Michaelis, celebrated in biblical criticism, Beckmann, late professor of Economy at Gottingen, Lichtenberg, the scientific electrician, the present Professor Blumenbach, whose numerous writings on physiology, comparative anatomy, and natural history, are well known in this country; and the late celebrated bibliographer Heyne, to whom the university library of Gottingen is chiefly indebted for the collection and arrangement of its valuable stores.

History.—It is unnecessary to carry back the history of Hanover farther than the end of the 12th century, when William Guelph, son of Henry the Lion, duke of Bavaria and Saxony, and Matilda, daughter of Henry II. of England, acquired the sovereignty of Luneburg. William was collaterally descended from Welph, son of Azo, marquis of Este in Italy, and of Cuniza, heiress of the Welphs, earls of Altorf in Swabia. William's son, or, according to some accounts, his brother Henry Otho, possessed both Brunswick and Luneburg, and thus formed the Duchy of Brunswick Luneburg. He was raised to the imperial throne of Germany by the name of Otho IV. In the 15th century Brunswick was again disjoined from Luneburg, and the latter remained with Bernard, grandson of Henry Otho. From 1521, when Henry, then duke of Luneburg, was put under the ban of the empire, till 1665, the dukes confined themselves to the title of dukes of Zell, though they had been gradually extending their possessions by the annexation of Grubenhagen and Calenburg; but in 1692, George William, last duke of Zell, obtained from the emperor the elevation of his younger brother Ernest Augustus, to the dignity of an elector of the empire. This prince was then bishop of Osnaburg, having obtained that episcopal sovereignty in terms of the treaty of Westphalia, concluded in 1648, by which it was agreed that the bishoprick of Osnaburg should be held alternately by a Roman catholic and a protestant prince, the latter to be always of the house of Brunswick Luneburg. The elector Ernest Augustus married Sophia, daughter of the elector Palatine, and of Elizabeth, daughter of James I. king of Great Britain. The dominions of the electorate were now farther increased by the addition of the counties of Hoya and Diepholtz; but they were still very small.

Ernest Augustus died in 1698, and was succeeded by his son George Lewis, then in his 38th year, who sixteen years after, by virtue of the act of protestant succession passed by the British Parliament, succeeded to the throne of Great Britain on the demise of Queen Anne. Although George was a warlike prince, and had distinguished himself in the wars between the Emperor and the Turks, he had not, before his accession to the British throne, enlarged his patrimonial territories; but in 1715 he obtained the addition of the duchy of Verden, and in 1719 the bishoprick of Bremen was also annexed to the electorate; but it was not till 1732 that his successor King George II. received from the emperor the investiture of both Bremen and Verden.

From the time that the electors of Hanover became kings of Great Britain, but more especially during the reigns of George I. and II., the affairs of the electorate were naturally involved in those of the kingdom. Hanoverian soldiers were employed rather as mercenaries than auxiliaries in the British wars, and occasionally even formed part of the standing army in Britain. On the other hand, the king of Great Britain, as an elector of the empire, thought himself obliged to use his newly acquired power in supporting the balance of Europe, and to engage in contests in which, but for his continental territories, he had little interest. Hence it is not surprising, that in the war between Britain and revolutionary France, Hanover, though understood to be neutral, should have shared the same fate with the other petty German states. In 1791 it was taken possession of by the Prussians, then in alliance with the constituted authorities of France; but at the peace of Amiens in 1802 it was restored to its legitimate sovereign; and at the same time the bishoprick of Osnaburg, which had been lately formed into a secular principality, was declared to belong to the Hanoverian territory. On the renewal of hostilities in 1803, Hanover and Osnaburg were invaded and occupied by the French under General Drouet; and Marshal Walmoden, commander of the Hanoverian forces, was compelled to sign a capitulation, which, though not sanctioned by the British monarch, secured to France and her vassals the sovereignty of Hanover during the usurpation of Napoleon. In 1806 it was again occupied by the Prussians; and on the erection of Westphalia into a kingdom in 1807, Hanover was adjudged to the new king, Jerome Buonaparte. The successes of Britain and her continental allies in 1813 having emancipated Germany from the tyrannical sway of the Buonapartian dynasty, Hanover was, through the intervention of a Swedish army, again restored to his Britannic majesty, and at the peace of Paris in 1814 was elevated to the rank of a kingdom, and enlarged by the annexation of the principality of East Friesland.

Principal towns.—Hanover contains about eighty towns, of which the principal are Luneburg, Harburg, and Zell, in the principality of Luneburg; Bremen, Verden, and Lauenburg, the chief towns of the provinces of the same names; Hanover, Hameln, and Nordheim in the principality of Calenburg; Gottingen, Hildesheim, and Osnaburg, the capitals of those provinces; Diepholtz in the county of that name; Eimbeck and Osterode in the principality of Grubenhagen; and Embden and Pappenburg in East Friesland.

Luneburg, or Lunenburg, is situated on the small river Ildenau, which flows into the Elbe near its mouth. It is built in the form of an oblong, and is defended by walls flanked with towers, and surrounded by a moat, forming altogether a circuit of about two miles, and containing 9000 inhabitants. The principal buildings are the Palais des Princes, and the Hotel de Ville, within a large square; the church of St Michael, furnished with a golden table; three other churches, three hospitals, and the fort commanding an extensive prospect. It has a college, an anatomical theatre, an academy for martial exercises, and a public library. An extensive manufactory of salt, producing annually about 120,000 tons, and employing a capital of two millions of rix dollars, is established in a suburb, hence denominated Salze. Luneburg also trades extensively in lime made from a remarkable insulated rock in the neighbourhood, in wax and honey, flax, wool, and linen. But the town is by no means now so flourishing as formerly.

Harburg is a sea-port town, situated near the estuary of the Elbe, opposite to Hamburgh, and about seven miles south of that city. It is well fortified, and has a deep and commodious harbour called the Latz, capable of admitting ships of considerable burden. The population is about 3,500, who are employed chiefly in trade and in the manufacture of starch, hats, stockings, and ribbons, and in works for bleaching wax and refining sugar. Besides these exports, much wood is cut in the neighbourhood, and shipped to France and Holland. Daily intercourse by packets takes place between this town and Hamburgh.

Zell, or Cell, forming the capital of the duchy of that name, stands on the south bank of the Aller, near its junction with the Fushe, about 47 miles S. by W. of Luneburg. It is a neat little town, with well paved streets. The chief buildings are the castle, now in decay; the penitentiary or zucht-house, which serves the purpose at once of a prison, a house of correction, and a lunatic asylum; the college, and the high school. At Zell is established the court of appeal for the whole kingdom, and a society for the improvement of agriculture has been lately instituted. In the neighbourhood are some large works for bleaching wax, in most of which the old method is followed, without having recourse to chemical agents.

Bremen is situated on the banks of the Weser, and contains about 40,000 inhabitants. See Bremen.

Verden is a small town situated on the north side of the Aller, near its confluence with the Weser. It contains about 4,000 people, and has a fine cathedral. As the river is navigable to the town, there is a good opportunity for trade, and of late the place has sent some ships to the Greenland fishery.

Lauenburg stands opposite to Luneburg on the north side of the Elbe, and carries on some trade in wood, fish, grain, flax, butter, and cheese.

Hanover, the capital of the kingdom, consists of two parts called the old and new city, situated the one on the right and the other on the left bank of the river Leine, across which are bridges that form the communication between the towns. The old town is built in an antiquated style, the upper stories of the houses successively overhanging those that are below, and the fronts ornamented with figures of heathen deities and warriors, or inscribed with passages from the psalms; but the new city is built on a regular and modern plan, especially the street called George straas. The site of Hanover is a sandy plain, but the environs of the city are richly cultivated, and abound in villas, gardens, and plantations. The old town is built in the form of a crescent, and is well fortified. Many of the streets are spacious and well paved; and of the public buildings the principal are the royal palace, formed of hewn stone, and now in a ruinous state; the palace of the duke of Cumberland; the electoral church; and the library in the new city, founded by Leibnitz; and also a theatre, a town-house, three other churches, three hospitals, and a poor-house. Of the two burying grounds near the city, one is destined for the Lutheran protestants, and contains several fine monuments, and the other is appropriated to the Jews.

As usual about all German cities, a public walk encircles Hanover, and in one part of it stands a small temple raised as a monument to the memory of Leibnitz. Several seminaries of learning, and a natural history society, are established; and some important manufactures have been carried on, particularly of lace, jewellery, tapestry, and printed cottons; but in general they are less flourishing than formerly. There is a foundery for cannon. Hanover contains about 20,000 inhabitants. East long. 9° 43′. North lat. 52° 22′.

Hameln is a strongly fortified town, containing about 4,000 inhabitants, situated at the confluence of the small river Hamel with the Weser. The principal buildings are the Hotel de Ville, the barracks, and the fort, and the chief manufactures are sugar, beer and leather. The trade is considerable.

Nordheim contains about 3000 inhabitants, and stands on the Rheime, near its confluence with the Leine. It is noted chiefly for the fine organ in the parish church, and a sulphureous spring in the neighbourhood, which has been converted into public baths.

Gottingen is built on the Leine, not far from its source, and is a neat well paved town, most of which has been erected within the last 100 years. It contains a population of 10,000 inhabitants, and has risen to eminence from the partiality of George II., who, in consequence of the advice of Baron Munchasen, his Hanoverian minister, founded the university in 1733. The town stands at the end of a long valley, and is surrounded with delightful walks. The only public buildings particularly deserving of notice are those connected with the university, as the library, the museum, an excellent observatory, a council-room, the public hall for lectures and examinations, and the lying-in-hospital. The library is not only one of the largest, but is supposed to be the best in Europe. It contains not fewer than 200,000 volumes, selected with great care, and arranged according to the most improved principles of bibliography. In the university are forty regular professors, who lecture on various branches of philosophy, jurisprudenee, medicine, and the arts; and besides the professors, about thirty lecturers are authorised to teach on different subjects. The German plan of frittering down human literature into minute subdivisions is carried to such an extent, that nearly 150 courses of lectures are given in one year. The number of students in 1818 was 1158. They are distinct from the inhabitants, and are subject only to the jurisdiction of the university court. In the vicinity a botanical garden, and a garden for promoting agricultural improvement, have been established.

Hildesheim is an ancient town on the declivity of a rugged hill on the river Innerste; is irregularly built, and contains a Roman catholic cathedral of Gothic architecture, in which is a monumental column supporting a chandelier of many branches,—besides eight protestant churches and several monasteries. The population exceeds 12000.

Osnaburg, or Osnabruck, is situated on the small river Hase, and contains 9000 inhabitants. It is said by Mr Hodgskin, in his late travels in the north of Germany, to be the handsomest and best situated city in his Majesty's German dominions. The surrounding country, though mountainous and rugged, is sufficiently fertile, and produces much flax that is manufactured into linen, and the linen is carried to Osnaburg to be stamped, registered, and sold. The coarse linen which derives its name from this town is now little used, having been nearly superseded by the introduction of cotton goods. In the cathedral, which is a fine edifice, are preserved an ivory comb and staff, said to have belonged to the emperor Charlemagne.

Diepholtz, situated at the northern extremity of the lake of Diepholtz, is a long straggling town, of little importance, except for a considerable manufactory of coarse cloths.

Eimbeck stands in a fertile country near the borders of the principality of Calenburg, where two small rivers, the Ilm and the Krunewasser flow into the Leine; is well fortified with a wall, moats, and various out-works; contains about 4000 inhabitants, some of whom are occupied in the manufacture of woollen cloth, and was formerly celebrated for its breweries.

Osterode, about six leagues east of Eimbeck, contains about 4000 inhabitants, and stands at the conflux of two small rivers near the Hartz mountains. It is remarkable for its public granaries, in which corn is stored up during times of scarcity to supply the miners and other labourers of the Hartz. A large castle is attached to it, and it has a manufacture of camblets.

Embden stands on the banks of the Ems, and contains 10 000 inhabitants; see EMBDEN, where it is stated that East Friesland belongs to Prussia. It is now included in the kingdom of Hanover.

Pappenburg is a clean neat little town, in East Friesland, with 3000 inhabitants, which has lately become of importance, in consequence of its flag having protected numerous merchant vessels during the late war. It stands in a boggy country, and has several canals 13 miles long, and capable of floating vessels of 150 tons burden. It is now a place of considerable trade, especially in the exportation of peat, and employs about 200 vessels.

HANSE, from the Teutonic language, signifies alliance or association, is an ancient appellation of a society or company of merchants, and hence hanse-towns were certain maritime cities united together for the mutual protection of their commerce. Bremen and Amsterdam were the first that entered into this league, which afterwards included many other towns in all the trading countries of Europe; and in the 12th century it is said not fewer than 72 cities were found on the list. Lubeck, Cologne, Brunswick, and Dantzick were the four principal cities in which courts or assemblies were held for the regulation of their commercial affairs. From having the wealth of Europe in their possession, the members of this alliance became so powerful that they had great influence in political affairs. They accommodated different potentates with loans of money, and hired their ships of war to defend them against their enemies.

HANWAY, Jonas, an English philanthropist, and author of various treatises on domestic economy, was born at Portsmouth in 1712, received his education, which was limited to his own language, and a little knowledge of Latin, with writing and accounts, in London, and was initiated in mercantile affairs in Lisbon, where he remained for a short time in the capacity of agent or factor. In 1743 Mr Hanway was assumed as a partner in a commercial establishment at Petersburgh; and soon after his arrival in that metropolis he was selected by the English merchants to undertake a journey into Persia, for the purpose of investigating the conduct of their agent, who was suspected of being more favourable to the designs of the Persian rulers than to the interest of his employers; but his mission was unsuccessful; and the history of his journey, and of the British trade over the Caspian was published in 1753, in four volumes 4to. Having, after a few years residence in Petersburgh, acquired what he considered a competence, he returned to Britain in 1750, and soon commenced his benevolent labours.

In 1754 he published a letter, suggesting various improvements for paving, lighting, &c. the streets of Westminster; and in 1756 appeared his "Journal of Eight Days Journey from Portsmouth to Kingston upon Thames, with an Essay upon Tea," a singular production, which was ably criticised by the acuteness of Dr Johnson. In this essay the author declaims against the use of the Chinese herb, and attempts to point out the pernicious effects which it would likely produce,—predictions which its more extended use has not verified. Mr Hanway was next occupied in promoting a scheme which was supported by subscription, for providing the navy with sailors, by furnishing poor children with necessaries for that service; and soon afterwards he became a zealous advocate for the establishment of another excellent institution, the Magdalen charity. The Foundling hospital, and the nature and tendency of the establishment; the preposterous practice of giving vails, which had become really oppressive to those who visited the families of the great; the promoting of subscriptions for the relief of sufferers by fire at Montreal, in Canada, and Bridgetown in Barbadoes; the improvement of the condition of chimney-sweepers' apprentices; and the relief of poor Africans in the metropolis, successively occupied the beneficent exertions of Mr Hanway in the latter years of his life; and such was the impression which his philanthropic endeavours made on the minds of his fellow citizens, that a deputation of them waited on the minister, with an earnest request to have some public mark of approbation bestowed on a man who, at the expence of his private fortune, had proved of such essential service to mankind. This request was answered in his appointment to be one of the commissioners for victualling the navy, a situation which he held for 21 years, at the end of which time his declining health compelled him to resign. He died in 1786.

HARBOROUGH, a town of Liecestershire in England. See Leicestershire.

HARBURG, or Haarburg, a town of the kingdom of Hanover, and not far distant from the river Elbe. See Hanover.

HARFLEUR, an ancient town in the department of Lower Seine in France, has now fallen greatly to decay; the fortifications have been demolished, and the harbour is choked up. It is five miles from Havre de Grace. The population is stated at less than 2000; and manufactures of cotton, linen, and lace are carried on.

HARLEM, or Haerlem, an ancient town of Holland, with spacious and regular streets, traversed with canals, and adorned with trees. Some of the public buildings are elegant structures, and the organ with which the church is furnished has been long celebrated as one of the finest instruments of the kind that has yet been constructed.

The population of Harlem is estimated at 30,000. The chief manufactures are satins, ribbons, velvets, linen, damask, and worsted stuffs. The art of bleaching has arrived at great perfection in the vicinity, and the culture of bulbous flower roots, some of which have brought extravagant prices, is very extensive. Laurence Coster, to whom is ascribed the invention of the art of printing, was a native of Harlem; and the museum of natural history, collected and arranged by Van Marum, is now one of its chief ornaments.

HARMATTAN, a periodical wind which blows from the interior regions of Africa toward the Atlantic ocean; and while it is accompanied with a thick fog, dries up and withers every vegetable production, and is at the same time favourable to the health of man. But it seems probable that the history of this wind is exaggerated, or inaccurately detailed.

HARMONICA, a musical instrument, consisting of glasses in the form of tumblers or drinking glasses. They are of different sizes for the different notes, and they are tuned by diminishing the thickness of those that are too sharp; and being fixed on a horizontal spindle, which is moved by the foot, they are played upon by pressing the wetted finger for a longer or shorter time, according to the length of the note, on the glass which gives the sound required. When chords are wanted, the instrument is played upon with both hands. An instrument of this kind is particularly described by Dr Franklin. But, before his time, Mr Puckeridge from Ireland had constructed and exhibited an instrument on a similar principle; and some readers will recollect the performance of Mr Cartwright a few years ago in different parts of Britain. In the latter case, the different glasses are arranged in a frame or box, and are tuned by pouring in water till the note required is produced.

HARMONY, a certain combination of musical sounds, or a succession of chords agreeable to the laws of modulation. See Music.

HARP, a musical instrument of the string kind

Harrington ‖ Harris.

the use of which, or of a similar instrument, is traced to the remotest antiquity. The harp was a favourite instrument among the Irish and Welsh; and the discovery of two old harps in the family of Robertson of Lude in Scotland, one of which is supposed to have belonged to the unfortunate queen Mary, led Mr Gunn to undertake a curious disquisition concerning that instrument Those who wish for information on this subject will be amused and instructed by a perusal of his Historical Inquiry.

HARRINGTON, James, an English author who flourished in the 17th century, was educated at Oxford, and was in great favour with Charles I., whom he attended to the scaffold. During the protectorate he wrote the political romance called *Oceana*, which was dedicated to Oliver Cromwell. After the restoration he was charged with treasonable practices, and committed to the tower. He died in 1677, and his works were published in a folio volume in 1700; and a more complete edition, under the superintendance of Dr Birch, appeared in 1737.

HARRIOT, Thomas, an eminent English mathematician and astronomer, was born at Oxford in 1560, and was educated in that university, lived in the family of Sir Walter Raleigh as preceptor, and in 1584 accompanied his first colony to Virginia, where he was employed in surveying and constructing maps of the country. When he returned he published, in 1588, an Account of Virginia, which was afterwards reprinted in Hakluyt's Voyages. By the munificence of the earl of Northumberland, who was the distinguished patron of learned men at the time, and to whom he was introduced by Sir Walter Raleigh, Mr Harriot enjoyed a liberal pension. He died in 1621.

It is not a little singular that the merits of Harriot as an astronomer should have remained unknown to his own countrymen for more than 150 years, and that it should have fallen to the lot of a foreigner, baron Zach, astronomer to the duke of Saxe-Gotha, to make the fortunate discovery of the valuable manuscripts of the forgotten and neglected philosopher. The papers alluded to were found in 1784 at Petworth in Sussex, the seat of the earl of Egremont, whose predecessor, the earl of Northumberland, as the celebrated German astronomer expresses it, not only generously promoted learning in general, but patronised and encouraged the learned men of his age. "Thomas Harriot, the author of the manuscripts, Robert Hues, well known by his treatise on the globes, and Walter Warner, all three eminent mathematicians, who were known to the earl, received from him yearly pensions; so that when the earl was committed prisoner to the Tower of London in 1606, our author, with Hues and Warner, were his constant companions, and were usually called the earl of Northumberland's three Magi."

The treatise on Algebra was published in 1631. His astronomical observations relate to the spots on the sun, the satellites of Jupiter, and to the comets of 1607 and 1618.

HARRIS, James, an eminent English philologist, was a native of Salisbury, and was born in 1709. His mother was sister of the earl of Shaftesbury, the celebrated author of the Characteristics. Mr Harris was educated at the grammar school of his native city, and at Oxford, and commenced the study of the law at Lincoln's Inn; but succeeding to the patrimonial estate on the death of his father, he assiduously directed his attention to the more congenial study of ancient literature. His first work appeared in 1744, consisting of three treatises on art, on music, painting and poetry, and on happiness; and in 1751 he published his Hermes, or Enquiry concerning Universal Grammar, which at once raised the reputation of the author, and long continued a book of standard authority. The other literary productions of Mr Harris are his "Philosophical Arrangements," which appeared in 1774, and "Philological Enquiries" in 1780. Mr Harris also appeared as a public character. He had a seat in Parliament for 20 years, was a short time one of the lords of the Admiralty, and afterwards one of the lords of the Treasury, and finally, secretary and comptroller to the queen. He died in 1780.

Harrison.

The Hermes of Mr Harris was severely attacked by Horn Tooke, in his singular work "The Diversions of Purley," and although some of his views of the subject required correction, yet the wanton abuse and unsparing severity in which that political adventurer has indulged against all who differed in opinion with him, will scarcely admit of a sufficient apology in the soundness of his criticism and the acuteness and plausibility of his conjectures on doubtful matters. An edition of his works, in two vols. 4to, was published after his death by his son, who was long employed in diplomatic missions, and for his services was raised to the rank of nobility by the title of Lord Malmesbury.

HARRISON, John, the inventor of the timekeeper which goes under his name, was a native of Yorkshire; was born in 1693, and in the earlier part of his life assisted his father in the business of a carpenter, with which were occasionally conjoined the repairing of clocks and watches, and the surveying of land. From his childhood young Harrison discovered a strong attachment to the study of every kind of machinery moved by wheels; and, with the scanty education which he had received, embraced every opportunity of improving himself in mechanical knowledge. A manuscript copy of professor Saunderson's Lectures having fallen into his hands, he carefully copied the diagrams and transcribed the whole.

In 1726, Harrison, guided by his own ingenuity and mechanical dexterity, succeeded in the construction of two clocks, chiefly of wood, in which he applied the escapement and compound pendulum of his own invention; and they were found to go so accurately as scarcely to err a second in a month. In 1728 he made a visit to London, and exhibited drawings of a machine for determining the longitude at sea, but was advised to construct the machine before making application to the Board. In 1735 he completed the first machine, and was greatly encouraged to proceed in his improvements by the trial of it in a voyage to Lisbon. The second machine, constructed in 1739, was simpler in its form; and the third, which was produced in 1749, was still less complicated. But in the improvements which he made on pocket watches, he was led to the fortunate construction of his fourth time-keeper, which is in the form of a watch, and about six inches in diameter. With this instrument his son made two voyages to the West Indies, and this trial was so satisfactory that the inventor was rewarded with the premium offered by the Board of Longitude, which amounted to L.24,000, although, it is said, many obstacles were thrown in the way before the payment was made. The four instruments were delivered up to the Board of Longitude, and they are now deposited as mechanical curiosities in the Royal observatory at Greenwich. The time-keeper was copied by Mr Kendal, and was found to answer equally well with the original during captain Cook's three years circumnavigation of the globe in the southern hemisphere. Mr Harrison published in 1775, an account of mechanism for the measurement of time; and in the same work he describes a new musical scale, which is a mechanical division of the octave, according to the proportion which the radius and diameter of the circle have respectively to the circumference. He died in 1776.

HARROW-ON-THE-HILL, a village of Middlesex in England, stands on an elevated spot, and is celebrated for the free school which was endowed in 1592. The population is about 1700.

HARROWGATE, a village of Yorkshire in England, has of late years risen to celebrity on account of its mineral springs, and the resort of company from all parts of the kingdom for the purpose of bathing and drinking the waters. Two of the springs are of a chalybeate quality; and two other springs at Lower Harrowgate, which is at some distance, are of a sulphureous nature. The permanent population of Harrowgate exceeds 1500; and for the accommodation of strangers large inns and excellent lodging houses have been fitted up.

HARTFORD, a town of the state of Connecticut in America, is situated on the west bank of Connecticut river, contains about 4,000 inhabitants, some of whom are occupied in woollen manufactures.

HARTLEPOOL, a sea-port town of Durham in England, stands on a promontory which is nearly encompassed by the sea, is chiefly occupied by fishermen, but is much resorted to during the bathing season. The population exceeds 1000.

HARTLEY, David, a celebrated metaphysical writer, was a native of Yorkshire, was born in 1705, and was educated at Cambridge. He was originally destined for the church, but, from certain scruples concerning subscription, relinquished his views, and qualified himself for the medical profession, which he practised in Nottinghamshire, London, and Bath, at which latter place he died in 1757. The first literary labours of Dr Hartley were immediately connected with his own profession. He published in 1737 " A View of the Present Evidence for and against Mrs Stephen's Medicines as a Solvent for the Stone;" and it is said that he wrote a treatise in defence of inoculation for the small-pox. But his greatest work appeared in 1749, and is entitled, " Observations on Man, his Frame, his Duty, and his Expectations." In this work, Dr Hartley has attempted to trace all the operations of the human mind to the power of association; and in explaining the nature of sensation, he ascribes it to certain vibrations that take place in the nervous system. Like many other metaphysical disquisitions, the doctrines of Hartley have had their day, and the number of his followers is now probably very small.

HARTOGIA, a genus of plants belonging to the Monœcia class.

HARTZ, a chain of mountains which traverse Hanover, and has been long celebrated for its mineral riches, and particularly for the production of lead, copper, and some other metallic ores.

HARVEY, William, an eminent English physician, and the illustrious discoverer of the circulation of the blood, was a native of Kent; was born in 1578, and was educated at Canterbury and Cambridge. He completed his medical studies at Padua in Italy, where he graduated; on his return to England he became a member of the college of Physicians, and, by their appointment, delivered lectures on anatomy and surgery; and as it is understood that he was acquainted with the structure of the valves of the veins from the lectures of Fabricius Abaquapendente of Padua, it is supposed that he threw out some hints in his lectures relative to his great discovery. The treatise entitled " *Exercitatio Anatomica de Cordis et Sanguinis motu,*" in which this fine discovery was announced and illustrated, was published at Frankfort in 1628; and although it was received and admired by liberal minds as one of the most important that had ever been made in the progress of anatomical investigation, yet it was opposed and controverted by those who were bigotted to former doctrines as a dangerous innovation. At an advanced period of life he published his treatise " On the Generation of Animals;" and both these works may be recommended as fine examples of philosophical investigation, conducted by ingenious experiments, and detailed with great perspicuity.

Harvey rose to the highest eminence in his profession; he was extraordinary physician to James I. and was attached to the person of his ill-fated son Charles I. as physician in ordinary. He accompanied the royal family to Oxford; and when the king fled from that place he returned to London. He died in 1657, when he had reached the 79th year of his age, and was buried at Hampstead, where a monument was erected to his memory. In the preceding year he formally bequeathed his patrimonial estate to the college of Physicians, by which body a splendid edition of his works, in a single 4to volume, was published in 1766.

HARWICH, a sea-port town of Essex in England, at the north-east extremity of the county, contains nearly 4000 inhabitants, many of whom are employed in the fisheries or in the packet-boats to the Dutch coast, and is much resorted to in summer for sea-bathing.

HASSELQUIST, an eminent Swedish naturalist, was a native of East Gothland, and was born in 1722. While studying at Upsal, he became a favourite pupil of Linnæus; and from the hints thrown out by that naturalist of the advantages of carrying on botanical researches in foreign countries, he was inspired with the ambition of travelling. The place fixed upon was Palestine; and with this view he reached Smyrna towards the end of the year 1749;

Hasselquista

and having visited Alexandria, Rosetta, Grand Cairo, Damietta, and Palestine, in the course of the years 1750 and 1751, he returned by Cyprus and Rhodes to Smyrna, where an insidious disorder, pulmonary consumption, brought him to the grave in 1752.

The manuscripts and collection of objects in natural history being seized for a debt which he had contracted during his journey and illness, were redeemed by the queen of Sweden, and placed under the superintendance of Linnæus, who published the travels of the author under the title of "Iter Palestinum;" a work which is often referred to, and has been translated into English and other languages.

HASSELQUISTA, a genus of plants belonging to the Pentandria class.

HASTINGS, a town of Sussex in England, and one of the cinque ports, had formerly a good harbour, now filled up with sand, and contains about 4000 inhabitants. A great deal of fish, as mackerel, herrings, soles, and other kinds, is taken in the adjoining seas, and conveyed by land for the supply of the London market. Hastings is much resorted to for sea-bathing.

Hastings.

Hastings is remarkable for the battle which was fought in its vicinity between Harold king of England and William duke of Normandy on the 15th of October 1066, when the former was defeated and slain, and the latter acquired the title of *Conqueror*,—an appellation which has been retained in history. This decisive battle, which placed a foreigner on the throne of England, was fought on both sides with great obstinacy, and continued from morning till night. On the side of the Normans 15,000 men were slain, and William had three horses killed under him; and, beside the death of the king and his two brothers, the loss of the vanquished was still more considerable.

HAT-MAKING.

History.

A covering for the head seems to have been used in all ages and countries in which civilization and arts have made any progress. The Egyptians were not strangers to the head-dress; the size and dimensions of the turban distinguished those of superior eminence among the Persians; the turban, and a cap similar to that which the Romans used to give their slaves when they made them free, were known among the Jews; and in our own country knit caps, hoods, and silk thrummed hats, were used by the English. The ancient helmets were also constructed as coverings for the head.

The introduction of felt hats by a Swiss at Paris, about the beginning of the 15th century, has proved of great importance; and from the circumstance of Charles VII. having worn a hat lined with red silk, and surmounted by a tuft of feathers, when he made his public entry into Rouen in 1449, the use of hats first became general.

It appears that the art of manufacturing felt hats was known in Spain and Holland previous to its introduction into England, in the beginning of the reign of Henry VIII.; and in the second year of the reign of James I. the felt-makers of London became a corporation, with a grant of many privileges. The manufacture of hats as an article of commerce prevailed greatly in France, and exports were made to England, Spain, Italy, and Germany; but England has ultimately become the grand mart for hats.

In the making of felt hats, rabbits, moles, and hares fur,—beaver, lamb, seal, and otter's wool,—monkey, stuff, or neuter wool,—camels and goats hair, silk and cotton,—are the materials used. The foreign wools employed are, the Italian, Spanish, and Peruvian or *red wool*; and wool called *merino* is obtained from Spanish lambs bred in England. The native wools are those of Herefordshire, Southdown, Wye-side, Wiltshire, Somerset, and Hampshire. The backs of the different animals afford the best fur, and the fur of rabbits is most valued. Cod-wool is wool obtained from lambs that die in the birth, and long cod-wool is that which is plucked from lambs that die in early life.

Processes.

The felting process, which is the working together of hair or wool without spinning or weaving, depends upon the conformation of the surface of hairs and wool; for though their surface to the naked eye appears perfectly smooth, it is found to consist of lamellæ covering each other like the scales of a fish; and these lamellæ, by the operations which the materials undergo, coming into close union, the hairs are twisted into a compact substance fit to be formed into a proper wearable shape.

Carroting.—The materials being washed and carded, are cut to a proper length; and inferior stuffs, as clippings and tail-wool, are improved by the process of *carroting*. A layer of the stuff is placed in a proper vessel, and sprinkled over with a mixture of one part nitrous, or nitrous and sulphuric acid, and six parts water. Upon this a second layer is placed, and so on till the vessel is full, when its position is occasionally changed that the whole of the stuff may be soaked in the mixture. The stuffs thus become of a reddish yellow colour.

Bowing.—Preparatory to felting, the fibres of the materials are well separated by the bowing process. For this end a platform of wood, about four feet wide, is erected against the wall of the workshop, and divided by side partitions of uniform width, at each of which is a window. These partitions, called *hurdles*, are for the convenience of the workmen. By means of a cord fixed to the ceiling, a bow is suspended to each hurdle. The bow is a pole about seven feet long, and to it are fixed two *bridges* of hard wood, the upper one next the window called the *cock*, and the lower one the *breech*. To the upper part of the bow is fixed a bow-string, a long cat-gut line which is twisted round the pole, so that just sufficient length

Processes.

is allowed to come over the cock and breech and fasten at the under end. This, in case of the string breaking is, by untwisting it, to obviate the necessity of a new one. To prevent the wood wearing also, a strip of horse skin, or other similar substance, is fastened to the edge of each bridge; and that the workmen may always have a firm hold of the bow, a strap for his hand is affixed to it near the cord by which it is suspended. To the bow belongs the pin for plucking, which is a small stick knobbed at the ends. The workman is likewise furnished with linen cloths and brown paper, and baskets consisting of bars without crossing or interweaving.

The bowing commences by placing the materials on one side of the hurdle. The bow is held horizontally in the workman's left hand, and the bow-pin in the right; he then places the string, and gives it a pluck. The string inclining to the bow strikes into the fur, and in its return scatters it to a distance in a light open form; and by repeated strokes the bowing is thus accomplished. The quantity wrought in this manner at a time is generally about a third part of what is necessary for a hat, is denominated a *batt*, and is formed by the hand into an oval figure, having acute angles at the extremities. The batt remains to be *hardened* by a slight pressure of the hand; to qualify it for careful handling, another batt is then formed; and of the other third part two small ones are formed, and united to the preceding by pressure. By this subdivision of the materials, it acquires more consistency than if the whole were done together. That part of the hat designed for the band is bowed thicker than the rest, and the edges are turned even round by the right hand.

Felting.—The parts are now to be connected and so wrought, that the hairs all coalescing and twisting together, a close consistency is given to the whole. In this procedure a wet cloth is first folded into a triangular form and laid on one of the batts; the extremities, with a small portion of the upper part, are then folded over the cloth, and the edges meeting form a conical cap. This cap is laid on the second batt with the joining downwards, and folded up like the first; a second wet cloth is closely folded over the whole to preserve the triangular form; and brown paper is sometimes used between the sides of the batts to prevent their felting together.

The next process is *basoning*. The bason is a circular piece of iron, and is laid over a hole in a plank, under which is a small grating fitted to the plank. The prepared cap is to be laid on the warm iron, and felted by folding, pressing, and sprinkling with water for a time. In this operation care must be taken that all the parts remain of uniform thickness. The edges, or original folds, in particular, are apt to be rendered uneven, and their position must be altered by turning round the cap, and where any thinness appears, the deficiency is made up and wrought on the bason. The basoning occupies about half an hour.

Still farther to promote the cohesion of the hairs, the hats are subjected to boiling for six or eight hours in a mixture of about one part urine to six parts soft water; and to prevent their touching the boiler, they are covered with a cloth, and either a basket is used or the boiler is sufficiently lined with straw.

Wool Hats.

Working or planking at a water-bath is next had recourse to, and in this operation an apparatus called a *battery* is employed. This apparatus consists of a number of planks joined together in the form of the frustum of a pyramid, supported by stone or brick-work, and meeting at the bottom in a kettle, under which is a fire-place; and it is denominated a five, six, or seven room battery, according to the number of planks. These planks are from two to three feet broad, and two feet deep; the kettle, filled with soft water, is kept nearly boiling; and some softening substance, as spermaceti, a marrow-bone, or a spoonful of oat meal, is thrown into the bath to facilitate the felting.

The article being carefully dipped in the bath, regularly rolled in various directions, and occasionally turned inside out to prevent the sides felting together, is found to contract and improve in consistency; and, for this purpose, by degrees, the dippings are more rapidly made, and the rolling done harder by means of the *walking-pin*.

The substance, by the processes just described, becomes a soft flexible felt of a conical form; and to reduce it to a proper figure is the next consideration. The edge of the hood is turned up about one and a half or two inches, the point is indented, and the hood turned over to produce a second inner fold of the same depth; and thus from three to five folds are formed, and the whole appears a flat piece, having a number of wave-like undulations. It is next laid upon the plank, kept wet with warm water, and the central point is extended with the right hand, while, with the left, it is pressed down and turned round till a flat portion equal to the crown of the intended hat is formed. This flat is placed on a block, the remainder is pulled down its sides, and a string tied tightly round; it is then forced down to the bottom of the block by means of an instrument called the *stamper*, which forms the band, and the brim is kept flat by wetting and extending the edges. After this the water is pressed out, and the nap raised by carding; the hat is taken off the block, and removed to a stove where it dries; and is then ready for the operations of dyeing, stiffening, and finishing.

Wool hats.—The account now given applies to felt hat-making in general, but some other matters require to be noticed. The external appearance of wool hats, or *cordies*, is ingeniously improved by laying on the body of the hat, when partly felted, a portion of a finer material, as cod-wool or camel's hair; but the cod-wool, before application, requires to be washed, carded, and boiled in one part urine to 12 or 14 parts soft water. The pieces of the finer material are worked on the body of the hat by basoning. Thin layers are also basoned for each side of the triangular hood, and a piece for the inside of the brim. The hairs of the fine material are fixed to the hat by the roots, and the extremities form the fine nap. Hats thus covered obviously require less of the common materials in proportion to what is used of the fine, and they also undergo the usual processes already alluded to. The quality and quantity of the napping, too, must regulate the

Stuff Hats.

value of the hat. Beside the plain cordies the manufacturer distinguishes *tips*, which have the nap laid on by the hand without basoning; *tips* and *naps*, which are superior to the preceding; and *covers*, which are the best. To form a good cover two ounces of cod-wool and one ounce of hair are bowed together.

Plated hats.—These have been invented within the last fifty years, as a medium between cordies and stuff hats, and they have the advantages of a shewy appearance and low price. In this branch of the manufacture the different materials are plated on wool bodies. The wool body is first boiled in one part urine to three parts water, then sufficiently felted, and being placed over a hair-cloth on the plank, the nap is laid on the surface, sprinkled with a brush, and pulled down. The nap is then completly fixed by frequent dippings in the bath, striking against the hair-cloth, and patting with the brush. But to preserve the nap from flying off during the operation, a layer of old stuff having its felting properly destroyed, together with carded cotton, is bound and laid on the body of the hat, and the hot liquid fixes it. After about an hour the old stuff and cotton are taken off by striking with a flat stick and shaking for some time. The bodies having been previously boiled, and the nap being soft and smooth, pure water only is used in the kettle. For plating, neuter wool makes a short neat nap; seal wool naps wear well; and, for the best hats, some beaver is used with the other materials.

The common method of napping is sometimes united with that of plating in stuff-hats, and such are called *shake-offs*. A first nap is shaken on, then a second or principal nap in the same manner as in plated hats; and thus a shorter fur may be employed to advantage, or one of the usual length will have a more shewy appearance.

Stuff-hats.—It appears that stuff-hats were at first entirely made of beaver. But this expensive material is now used merely as the nap, while inferior stuffs compose the body of the hat. The ingredients used by Mr James Burn of Alnwick, who obtained a patent for the manufacture of superfine hats, were three ounces and a half of mole's fur, two ounces and a half of beaver, and a quarter of an ounce of Aleppo wool; and to qualify the mole's fur he used aqua regia corrected by a little Florence oil.

The fibres of stuffs being more readily separated than those of wool, a slighter bow and finer bow-string are used than what has been described. The batts being formed, they are gently pressed down in the gathering basket, which consists of open straight bars, interwoven very little, and is about 18 or 20 inches square. This basket is also used for shifting the stuff and forming the batt, and one or two of them are placed under the stuff that any impurities may pass through. But, for this latter purpose, a fine moveable wire-frame is used in some manufactories. The first hardening process of the batts is effected by covering them with a skin of smooth leather or sail-cloth, and gently pressing or moving them about with the hands to promote the union of the fibres. The formation of the cap is similar to what has been described, only the inlayer is a piece of wetted paper instead of cloth; and it is wrought in the hurdle by the hand, the heat of which supplies the place of the bason. The planking next succeeds. Owing to the fineness of the materials no softening substance is required; and, instead of the boiling process for wool hats, about a wine glass of sulphuric acid is put into the bath, and small quantities are added as found expedient. The hat is first dipped and then suffered to lie on the plank till cold; but this procedure, which is called *soaking*, is unnecessary for hats previously boiled.

Dyeing.

Dyeing of hats.—The colour of hats is generally black, drab, or white. White hats have a nap of rabbit's fur, selected from the white skins; and drab hats are made of stuffs of the natural colour. For dyeing black, Campeachy logwood, copperas, and French verdigrise, are employed; but for common hats, sulphate of copper (blue vitriol) is sometimes used. In dyeing common cordies, the proportions for 12 dozen are about 24 lbs. logwood, 7 lbs. copperas, and a quarter of a pound of verdigrise. The logwood in chips is soaked in the boiler the preceding night, and the copperas and verdigrise are introduced in parts and boiled with the logwood. Each hat is fastened on a block with a string round the band, and thus introduced into the liquor for boiling, and weights are used to keep the hats under. After an hour's boiling, the hats are taken out and exposed to the open air, which very much improves the dye: this boiling and airing is several times repeated according to the strength of the dye and quality of the hats; and when the dyeing is accomplished, they are well washed in pure water.

The high price of galls precludes their being used for dyeing hats; but it is found that oak bark is an excellent substitute for galls in producing a full, beautiful, and durable dye, and indeed the oak barks have even been thought superior to galls.

In the method of dyeing the finer kinds of hats in France, 100 lbs. of logwood, 12 lbs. of gum, and six lbs. of galls, are boiled in water for some hours, when six pounds of verdigrise, and 10 lbs. of green vitriol, are added. This liquor is kept simmering a little below boiling; 10 or 12 dozen hats, each on a block, are introduced, and kept down by cross bars for about an hour and a half, after which they are taken out to be aired, and another set put in their place. The two sets are dipped and aired alternately eight times, fresh ingredients as required being introduced into the liquor.

In 1782, Mr Golding of London procured a patent for dyeing hats green on the underside. To preserve the hat from the action of the dye, he spread over the upper surface a thin paste of flour or clay, and inclosed it in a funnel to prevent the dye from penetrating. The hats are first boiled in alum and argil, and then in a dye prepared of fustic, turmeric, ebony, weld, safflower, saffron, indigo, and vitriol, with chamber-ley, or pearl-ashes. These are used altogether or not, according to the degree of colour required. When spots penetrate the hat, they are removed by washing in a strong alkaline liquor; and yellow spots are taken off by either of the mineral acids. Hats now are commonly dyed green with a liquor whose basis is a solution of indigo in sulphuric acid, and sometimes the brim of the hat is composed of two separate pieces of felt,—the under one being first dyed green, and then glued to the upper part.

As soft water is essential for dyeing hats, where it cannot be had in sufficient abundance, hard water may be prepared for the purpose, by putting 24 bushels of bran into 10 hogsheads of water, and the water of a large boiler being poured while nearly boiling into the vessel containing the hard water and bran, the fermentation commences, and the water is ready in about 24 hours.

Stiffening.—For the purpose of stiffening, glue, vinegar, beer-grounds, or dregs from the distilleries, are made use of. The hat to be stiffened is put into the crown of a large hat which is felted and blocked for the purpose, and has the crown slip so as to admit the hat readily to a sufficient depth; it is then placed over the hole of a plank on which the brims are supported. The warm dregs are first applied on the inside of the crown with a large brush. The brush is held in the right hand, and with the left the workman holds the brim of the stiffening-hat, and turns it constantly round that the dregs may be uniformly laid on. The glue, in the proportion of one pound to three pints of water, is applied to the crown when it is dry in the same way as the dregs, and then it is well rubbed with the hand. Particular care is paid to the glueing of the band, it being the principal part of the hat, and most liable to wear. When many hats are glued at once, the crowns only are attended to at first; and, for common hats, the glue and dregs are mixed and applied at once. The brims are next stiffened with glue on the under side, which is worked into the felt with the hand; the hats are then taken to the stove. When dry the glue is removed from the under side of the brim, and the nap raised, by applying warm soap-suds with a brush, and pressing with the blunt edge of a stamper. Some light goods are stiffened with starch, or common flour-paste. A solution of glue in a strong and mucilaginous decoction of lintseed was long considered as a stiffening both economical and beneficial to the hat, and used in the manufactories of France. Likewise a decoction of the glutinous matter of the leaves of horse-chesnut with the solution of glue has been successfully employed in that country.

Water-proof hats.—Glue is of itself insufficient to render hats water-proof, and among other expedients for that purpose *balling* may be noticed. A ball consists of three parts of rosin, four parts bees-wax, and two parts mutton-suet, and this is well rubbed over the inside of the hat during the planking process, and the hat is afterwards stiffened with glue. The stiffening of water-proof hats has been much attended to; but the most successful stiffening, which is said to consist of a solution of caoutchouc, is only known to a few manufacturers. Messrs Ovey and Jepsin of London, in 1802, took out a patent for water-proof stiffening. Their method is, to prepare a double hat, the inner part coarse, and stiffened with a preparation of one pound and three quarters of flour, three quarts of water, one ounce of alum, and two ounces of rosin; the outer part, being finely pulverised, is applied while the other is boiling, then the parts are stirred together, and the under part of the outside casing being covered with the cement, is united to the inner casing by pressing with a cool iron. Mr Hance of Southwark also obtained a patent for beaver and other water-proof hats, which is thus described. A thin shell, made of wool, hair, and fine beaver, forms the crown of the hat, and another shell of the same materials forms the brim. The parts are dyed and finished without stiffening, which after rain is apt to hurt the hat. The shell may be made of one piece, of a hat shape, blocked deep enough to admit of the brim being cut from the crown. The under side of the shell and the inside of the crown are then rendered water-proof, by laying on a coat of size or thin paste, of strength sufficient to bear a coat of copal varnish, and when dry a coat of boiled lintseed oil. The crown, when dry, is put on a block, and a willow or cotton body, wove on purpose, is cemented to the inside; it is then finished with a hot iron. In like manner the brim is cemented to a body of willow or other fit substance. The brim and body are next pressed together and sewed. The under side of the brim is covered with an addition of beaver or silk shag; and to prevent rain getting in, the edge is oiled and varnished with boiled lintseed oil and copal varnish. For cementing the parts together, one pound of gum-senegal, one pound of starch, one pound of glue, and one ounce of bees-wax, boiled in a quart of water, is applied. Water-proof hats of this kind, after the heaviest rain, require only to be wiped with the handkerchief.

Finishing.—The hat, after stiffening and drying, requires to be blocked into a regular shape; and for this purpose, it being necessary to soften the glue by means of steam, a hot iron is placed within a circular frame, on which a wet cloth is thrown; and the crown of the hat is raised over the steam, the brim resting on the frame. After this the nap receives its smoothness and polish, by the application of a hot iron of 20 or 25 lbs. weight, and a proper quantity of water. When glue happens to be drawn through the hat by the heat of the iron, it is taken off with a warm moist brush, and the nap is raised by carding. The brims of round hats are generally cut with a small worn out card, having a number of notches cut in it for the purpose of admitting the point of a knife. The hat remaining on the block, the inner edge of the card is placed close to the crown; the point of a knife, placed in the proper notch, is drawn round with the card, and the brim is thus evenly cut to any dimensions. The hat is put in shape, by placing a screw across and forming the brim while warm with the hand. The coarse hairs are then picked out with steel pickers; and after lining and binding, it is ready for the market.

Straw hats.—Hats or bonnets for women are likewise made of beaver, chips, and particularly straw, formed into plaits. In plaiting straw for bonnets, the straws being properly selected are cut to certain lengths, and then purified by the vapour of sulphur. They are next split by means of a wire prepared for the purpose, softened in water, and plaited with great dexterity. Previously to making up the plait, it is much improved by being passed through an apparatus called a mill, which consists of two small rollers, which press against each other by means of a cross

Straw-hats.

bar and screw of wood, and the milling is done by turning a handle attached to the under roller.

The bonnet is formed of the plaits, by first preparing a centre for the top, about which a sufficient number of rounds is sewed, and the top is finished by stiffening and blocking with an iron containing a heater red hot. The outer round of the top is then turned down, and the band is sewed and blocked, after which the front is formed. The different kinds of fronts are shaped by means of the slopes, or pieces of plait, next the crown. Great attention is paid that the joinings of the plait may not appear. The proper shaping and sewing of the bonnet are no doubt much to be attended to; but however well these are managed, the good appearance of the hat depends upon the purity of the straw, and the stiffening and blocking; and indeed no labour is spared with the iron in effecting a good finish. Different manufacturers make a secret of the stiffening which they use, but isinglass or ivory dust answer very well. Old bonnets are renewed by washing with warm soap and water, and subjecting to the vapour of sulphur.

Straw-hats.

HATCHING is that process by which the young of oviparous animals are excluded from the egg, and is promoted by incubation, or the natural heat of the parent bird, by the temperature of the climate, or by artificial heat. Among birds, hatching is usually accomplished by incubation, by which the temperature of the parent is communicated to the eggs, and uniformly kept up during the whole necessary period. This period varies in different tribes, and its duration seems to be in proportion to the size of the bird. The incubation of the linnet continues about 14 days, of the domestic hen 21 days, and of the swan 42 days. Amphibious animals, as the crocodile and the turtle, deposit their eggs on the sandy shores of those regions of the globe of which they are inhabitants, and, without any farther care of the parent, they are hatched by the heat of the sun; and most insects deposit their eggs in such places as furnish food for the caterpillar, the succeeding stage of its existence.

The only requisites for hatching the eggs of birds are a certain temperature and the free access of air. To fulfil these requisites, the parent bird is understood, in some cases, never to interrupt her incubation, and during the whole of the period is fed by her male associate; or if she leave the nest in search of food, it is only for the shortest time, during which scarcely any diminution of temperature takes place; and that all the eggs may equally enjoy the benefit of the air, they are daily shifted from one part of the nest to the other. By attention to these circumstances, the process of hatching has been successfully imitated by artificial means. The practice of the art of hatching is alluded to by the ancients, and it seems to have commenced early, and is still carried on to a great extent in Egypt. The process is conducted in an edifice constructed of bricks or clay, and two stories in height. The heat is communicated to the floors on which the eggs are distributed by means of flues; ventilation is properly attended to; and in the usual time the exclusion of the young chickens is effected. In some of these edifices 40,000, or even 50,000, are hatched at the same time. The practice of hatching chickens by artificial heat is also in use among the Chinese at the present day. M. Reaumur, the celebrated French naturalist, instituted a very elaborate set of experiments, for the purpose of introducing the artificial mode of hatching into Europe. Those who wish for a full detail of these experiments may have recourse to the author's own work on the subject.

HAVANNAH, a sea-port and principal town of the island of Cuba, stands on the north side, and is celebrated for one of the finest harbours in the world. The population has been stated at 25,000, although by some it is estimated at more than double that number. See CUBA.

HAVERFORD WEST, the capital of Pembrokeshire, in South Wales, is built on the side of a steep hill, on the banks of the river Cliddy, at the mouth of which is a bay which admits vessels. The population exceeds 3000, and the town is the chief thoroughfare for travellers going to the south of Ireland.

HAVRE DE GRACE, a sea-port town of the department of the Lower Seine in France, stands in a marshy soil at the mouth of the river Seine; is defended by strong walls and deep ditches, and its numerous streets are adorned with fountains. The spacious harbour is capable of admitting 700 ships. The population is about 20,000. Manufactories of tobacco, starch, earthen-ware, tiles, bricks, vitriol, paper, and lace, have been established, as well as numerous rope-works, and houses for refining sugar; and the trade with America and the West Indies, as well as in the herring and whale-fishery, was formerly conducted on a large scale.

HAWARDEN, a town of Flintshire in North Wales, was formerly a place of great strength, and the remains of its castle are still visible. The population, including the parish, exceeds 4000, and in the vicinity is a large iron-foundery, as well as a manufactory of earthen-ware.

HAWICK, a town of Roxburghshire in Scotland, stands at the confluence of the rivers Slitrig and Teviot, tributary streams of the Tweed. The population, including the suburbs, which are connected with the adjoining parish, is about 4000; and the manufacture of woollen stuffs, particularly stockings and carpets, has been long established on a large scale. The nurseries in the neighbourhood are thriving and extensive.

HAWKESWORTH, JOHN, an eminent English author, was born about the year 1719, and it is supposed was for some time engaged in the mechanical profession of watch-making; but having devoted himself to literary pursuits, he undertook the well-known periodical work entitled "The Adventurer," by which he is best known as an author, and one half of which was written by himself. He was also the compiler of a "Collection of Voyages for making Discoveries in the South Seas;" for which he received the enormous sum of L.6000; but this work disappointed public expectation. He was also the translator of Telemachus, and author of some light dramatic compositions. He died in 1773; and the monument erected to his memory, at Bromley in Kent, bears the following inscription, from the last number of the "Adventurer."—"The hour is hastening, in which whatever praises or censure I have acquired will be remembered with equal indifference. Time, who is impatient to date my last paper, will shortly moulder the hand which is now writing in the dust, and still the breast that now throbs at the reflection. But let not this be read as something that relates only to another; for a few years only can divide the eye that is now reading from the hand that has written."

HAWKING is the method of taking wild fowl by means of hawks which are trained for the purpose. See Pastimes and Sports.

HAWKINS, Sir John, an English author and an active magistrate, was born in London in 1719; served an apprenticeship as an attorney, and was finally admitted as a member of that profession. But, during his apprenticeship, he was not unmindful of mental improvement, and by early rising, and the assiduous prosecution of his studies, he acquired a considerable knowledge of polite literature. His taste for music led him to become a member of the academy of ancient music, and he was one of the famous literary club instituted by Dr Johnson, with whom he lived in the most friendly habits. By his marriage, and the death of his wife's brother, he acquired a handsome fortune; and having relinquished the business of an attorney, he lived as an independent gentleman, and became a very useful magistrate; and from his knowledge and activity in the latter capacity, he afterwards received the honour of knighthood.

The first literary production of Hawkins was an edition of "Walton's Complete Angler," which he illustrated with notes, and to which he prefixed a life of the author. He contributed notes to the edition of Shakspeare by Johnson and Stevens; but his greatest work is the "General History of the Science and Practice of Music," in five vols. 4to, which appeared in 1776. The last of his literary labours was his Life and Works of Dr Johnson, in 11 vols. 8vo. which was published in 1787. The style of Sir John's writings has been charged with stiffness and want of animation; but in all his literary labours he seems to have employed a laudable industry. He died in 1789.

HAYDN, Francis Joseph, the most eminent of musical composers, after Handel, was born at the little town of Rohrau, about 15 leagues from Vienna, on the 31st May 1732. His father united the humble trade of a cartwright to the equally humble office of parish sexton; but he cheered himself and delighted his friends by sundry little performances of music,—an art which seems to have been the chief patrimony and enjoyment of the family. A very interesting description has been given of the weekly concerts of this little domestic circle; in which, at the early age of six, Francis Joseph used to stand before his parents, and to beat time, while the voice of one was accompanied by the harp of the other. Frank, a cousin of old Haydn, and schoolmaster at Haimburg, happening to be present at one of these performances, was much struck with the precision and excellent ear of the child; and being himself tolerably well versed in music, proposed to undertake his instruction,—an offer in which the parents cheerfully concurred. At the house of this relative he soon demonstrated his remarkable genius for music, by striking a sort of air out of two tambourines, by his facility in learning to play on the violin and some other instruments, and the excellency of his voice, which he was made to exercise at the parish-desk. His fame was thus so extended, even before he had reached his eighth year, that the *maitre de chapelle* of the cathedral church of Vienna, who was seeking recruits for his choir, heard of him, and, after a satisfactory trial of his uncommonly fine voice, arranged his future employment. Haydn frequently adverted to his delight on receiving from this person a plateful of fine cherries for his successful attempt at a *shake*,—an embellishment which he had not hitherto been taught how to accomplish. His establishment at St Stephen's afforded him few facilities for the study of music, to which, however, such as they were, he applied himself with an ardour and a fondness that seemed to exclude every other object of serious pursuit or amusement from his regard. The *maitre de chapelle*, whether from ignorance or indolence, bestowed little attention to his advancement, and left him almost altogether to chance and his own intuitive perceptions to gain acquaintance with the fundamental principles of harmony. This was a serious hindrance to the progress of Haydn, and necessarily exposed him to some errors in his first productions; but it probably, too, was one great source of that originality for which he was so justly famed in after life. He had no fixed master, and, with nearly the solitary exception of Fux's theoretical work, scarcely any written guide in his speculations. Hence his complete exemption from the common vices of imitation and mannerism.

When he was about 13 years of age, Haydn got access to the house of *Corner*, the Venetian ambassador, then resident at Vienna; and here he was noticed by the composer *Porpora*, now advanced in years, who was retained in compliment to the ambassador's mistress, a lady passionately fond of music. He now acquired the art of singing in the Italian style, and obtained a small monthly pension, which contributed materially to his comfort. He continued to sing in the choir till the age of 19, when his voice having broken, and a trifling, at least not a very heinous, offence, being thought unpardonable, he had to look out for a livelihood elsewhere. He was hospitably received into the family of one Keller, a peruke-maker, who had often enjoyed his performances at the cathedral; but though this was a present relief to his necessities, it entailed a marriage with one of his host's daughters, which was far from proving felicitous. Haydn now got some pupils for the piano-forte, and occasionally composed little pieces for them, which yielded him very moderate profits. The performance of one of his productions, as a serenade, under the window of *Curtz*, a well known buffoon and director of a theatre in Vienna, whose charming wife had excited the admiration of Haydn and two of his companions, was the means of bringing him still more into notice. The husband himself being greatly taken with the music, went down into the street, and inquired "who had composed it?" "I did," said Haydn boldly. "How! you; at your age?"—was the retort; to which was returned, "One must make a beginning sometime." "Gad, this is droll," replied Curtz, "come up stairs,"—an invitation with which Haydn readily acquiesced. The consequence was, his getting the poem of an opera, entitled "The Devil on Two Sticks," to set to music for the theatre of which Curtz had the management; and this, besides a sum of money equal to about L.12 sterling, procured him no small reputation. This was in his 19th year. But Haydn's excellence was neither to be confined to vocal music nor to be most signalized in theatrical compositions. About a year afterwards, in a set of *trios*, he ventured on that career which brought him so much fame. These were smartly attacked as innovations by the older musicians; but they made a powerful impression on those who had no prejudices to mar the pleasure which they were capable of yielding. In a short time the spirit and the genius of the composer overcame all opposition; and in reality an entire revolution was effected in the art by one of its youngest cultivators,—his first quartett in B flat completely establishing his heretical novelties in public taste.

Haydn, now about 20 years of age, removed to the house of M. Martinez, where he became intimate with the celebrated Metastasio, from whom he received several important instructions as to the fine arts and the Italian language. For six years, nevertheless, he had to struggle with poverty; and it was not till 1758, when he was engaged in the service of count Mortzin, that he was accidentally led to comfort and elevation. At the house of that nobleman, who was in the habit of giving musical entertainments, there happened once to be present the old amateur, prince Anthony Esterhazy. The performance of Haydn's symphony in A 3-4th time, delighted him so much, that he entreated the count to give up his composer. Some delay occurred in carrying the prince's desire into effect; but at length, very much to his own content, poor Haydn found himself established in the rank of second professor of music at the court of one of the first noblemen in Europe. The prince died about a year afterwards, and was succeeded by Nicholas, who, fortunately for Haydn, was equally attached to music. He was now in easy circumstances, and therefore, according to a promise, married the peruke-maker's daughter, whose behaviour and temper became so far disagreeable as to tempt him to seek consolation in the company of a female singer, which, it is to be feared, was as indefensible on the ground of morality, as it was calculated to render his own home less inviting. He at length separated from his wife, but provided liberally for her support.

Haydn remained for more than thirty years in the Esterhazy family, at the head of a noble orchestra, and in a condition which admitted the full developement of his extraordinary powers. In place of giving himself up to idleness and dissipation, he laboured assiduously during this long period; and hence it was that he produced such an amazing number of works in almost all the departments of the musical art,—instrumental, operatical, and sacred. It was a peculiarity of his, that he never thought himself in a right state for composing till he had trimmed his hair and adjusted his dress, as if he were going into public company. He is said, too, not to have depended on his muse, unless he had put on a diamond-ring, of which Frederick the Great had made him a present. In working on a subject, it is understood to have been usual with him to form a sort of ideal romance, the conception of which, as he developed its incidents and various parts, furnished him with sentiments or emotions, to which he endeavoured to accommodate his music. This imparted a peculiar interest to his compositions, and served to give names to them, which cannot well be understood to be applicable without the knowledge of this their origin.

Long after the triumphant establishment of his reputation, and when he was deprived by death of the society of Mademoiselle Boselli, Haydn was induced to visit London, on certain proposals made to him by the late Mr Salomon. He arrived there in 1790, and after a residence of more than a year, during which time he produced some of his finest works, and was honoured with a reception which did equal justice to his talents and the nation, he returned home so well pleased with his visit that he made another in 1794. This probably did not fully answer his expectation, and being tired with waiting for the opening of the king's theatre, for which he had undertaken to compose an opera, entitled the *Descent of Orpheus*, he set out for home, which he never afterwards left.

Out of the great mass of anecdotes and remarks, which are related in connection with his residence in this country, two may be selected here; one to illustrate what may be safely called the simplicity of his taste; the other, because, besides doing justice to a celebrated singer of British growth, it is highly to the credit of Haydn's gallantry and candour. "One day," says the lively writer of Letters on Haydn, "when I disputed with more nonsense than usual these oracles of art, (respecting the necessity of the *air* being good, in order that a composition may please, and the air being the soul of music, &c.) Haydn went and fetched a little blotted journal, which he had kept during his residence in London. He there shewed me a hymn, which he heard sung at St Paul's, in unison, by 4000 children. "This simple and natural air," added he, "gave me the greatest pleasure I ever received from the performance of music." The air is given, and is discovered to be a chant, not a hymn, written by Mr Jones, organist of St Paul's. The other anecdote relates to Mrs Billington. One day Haydn happened to find her sitting to Sir Joshua Reynolds, who had represented her in the character of St Cecilia listening to the celestial choir. "The portrait," said Haydn, "is a striking likeness; but, Sir Joshua will pardon me, there is a strange mistake." "What is it?" asked the painter, hastily.—

"You have painted her listening to the angels," replied Haydn; "you ought to have represented the angels listening to her."

In the year 1795, after he had heard the music of Handel in perfection, Haydn commenced his grand oratorio, *the Creation*, which he did not finish till 1798. About two years afterwards he composed his *Four Seasons.* The proceeds of these works, in addition to a pretty large sum which he had obtained on his second visit to London, enabled him to purchase a small house and garden on the Fauxbourg Gumpendorff, where he continued to reside during the remainder of his life. The latter of these works was, properly speaking, his last, as, though he attempted several other things, he either did not finish them, or they were scarcely to be called original. Of this sort were his admirable harmonies to many of the old Scotch tunes.

In the year 1805 he was advised to discontinue all studious occupation; and indeed the imbecility of his mind, as well as the state of his bodily health, rendered the advice obviously and imperatively necessary. His chief luxury at this period, and nearly his chief support, was *tokay*, which he was in the habit of sipping almost constantly. His most distressing evils were the dread of bodily sickness and the dread of wanting support. But he had occasional fits of pleasantry, and then would see his friends, who were all too much attached to him, by his unaffected simplicity of character and the tenderness of his heart, to say nothing of his celebrity, to suffer him to stand in need of whatever could contribute to his comfort. A report of his death, which spread in the year now mentioned, induced the Institute of Paris, of which illustrious body he was an honorary member, to cause a mass to be celebrated on the occasion. Haydn was much amused with the idea, and laughingly said, "If these gentlemen had given me notice, I would have gone myself to beat the time to the fine mass of Mozart which they have had performed for me." A still more interesting event is minutely described in the letters formerly quoted, the celebration of his birth-day, a short time afterwards, in the palace of prince Lobkowitz, where 160 musicians and a splendid company of more than 1500 persons assembled. "The poor old man, notwithstanding his weakness, was desirous of seeing once more that public for which he had so long laboured. He was carried into the room in an easy-chair. The princess Esterhazy, and his friend Madame de Kurzbeck, went to meet him. The flourishes of the orchestra, and still more the agitation of the spectators, announced his arrival. He was placed in the middle of three rows of seats, destined for his friends and for all that was illustrious in Vienna. Salieri, who directed the orchestra, came to receive Haydn's orders before they began. They embraced; Salieri left him, flew to his place, and the orchestra commenced amidst the general emotion. It may easily be judged, whether this religious music (his own *Creation*) would appear sublime to an audience, whose hearts were affected by the sight of a great man about to depart out of life." "Surrounded by the great," continues the narrator, in a style truly French, "by his friends, by the artists of his profession, and by charming women, of whom every eye was fixed upon him, Haydn bid a glorious adieu to the world and to life." His death did not, however, take place till 1809, and cannot be imputed to merely natural decay, as it was hastened by his mental sufferings on the hostile advance of the French army to the walls of Vienna. The old man's imagination represented the town as given up to fire and sword. Four bombs fell close to his house. His two servants ran to him full of terror, when he roused himself, got up from his easy-chair, and, with a dignified air, demanded, "Why this terror? Know that no disaster can come where Haydn is." A convulsive shivering prevented him from proceeding, and he was conveyed to his bed. This was on the 10th of May. On the 26th his strength diminished sensibly. "Nevertheless, having caused himself to be carried to his piano, he sung thrice, as loud as he was able, *God preserve the Emperor.* It was the song of the swan. While at the piano he fell into a kind of stupor, and at last expired on the morning of the 31st, aged 72 years and two months."

Haydn's works are amazingly numerous: 118 symphonies; 165 pieces for the baryton, a favourite instrument in his earlier days; 13 concertos for various instruments; 82 quartetts; 5 German and 13 Italian operas; 4 oratorios; with masses, canons, divertimentos, sonatas, and other pieces to a great amount. He every where shews perfect acquaintance with his art,—great fertility of invention,—a very original but a very natural taste,—and a mastery over the powers of various instruments, which had never been known before, and which probably will never be surpassed. In one respect he is peculiarly deserving of praise, the invention of beautiful airs. These he seems never to have sacrificed to the labour of science; and hence it is that his music can be relished though unaided by the powers of a full band. His defects are in the higher class of excellencies. He wants the extensiveness of Handel's range, the majesty of his conceptions, and that control over the soul which, by imposing a sense of awe, in concordance with the solemn grandeur of the subjects, gives a character to the compositions of Handel which emulates the most striking feature in the mighty muse of Milton.

HAYDN, Michael, a brother of the preceding, is conceived by some to have excelled him in some particulars. But he was less known as a composer, and indeed was of too retired habits to become very eminent. Several pieces of his composition have been preserved by Latrobe in a collection of sacred music, and are all excellent of their kind.

HAZARD is a game of chance, as the name indicates, and is played with dice. See Games.

HEAT is a term employed in a double sense, and signifies either the sensation or the cause of the sensation of heat, as when a person speaks of feeling heat when he approaches the fire, the heat of the fire is the cause of the sensation of heat excited in the body. For an account of the nature and effects of heat, see Chemistry.

The HEBRIDES, or HEBUDÆ, are a groupe of islands which, in a double range, skirt the west coast of Scotland, from the northern extremity of the island of Lewis to the island of Islay, not far distant from the northern coast of Ireland. The first appellation is supposed to be a corruption of the second, which had arisen from the error of a transcriber changing the *u* into *ri;* and from their position they are also denominated *Western Islands,* although in some descriptions this appellation is limited to the outer range; and in others it is extended to the islands of Arran, Bute, and the Cumbrays in the firth of Clyde.

The principal islands of the outer range include Lewis, which belongs to Ross-shire; Harris, North Uist, Benbecula, South Uist, Barra, and others, which are attached to Inverness-shire; and the inner range is composed of Islay, Jura, Colonsay, Oransay, Mull, Lismore, Coll, Tirie, Rum, Canna, united to Argyleshire; and Skye, Rasay, and Scalpa, comprehended under Inverness-shire. The whole number of the Hebrides is supposed not to be less than 300; and the amount of the population has been estimated by some at 60,000, and by others at 80,000.

Islay.—The island of Islay, which is the most southerly of the Hebrides, lies to the south-west of Jura, and is about 25 miles in length from north to south, and 18 miles broad from east to west. The coast, which in many places is rugged and rocky, and skirted with many small islands, is indented by numerous bays, some of which form safe and commodious harbours. The surface of the island is greatly diversified; on the east it rises to a mountainous elevation; but in the western districts, in the vallies, and along the shores, it is covered with good soil, and susceptible of profitable cultivation.

The island is well watered by numerous streams, the principal of which is the river Laggan, which falls into a bay of the same name, and abounds with trout and salmon. The surface is likewise diversified with several lakes, on an islet in one of which, called Finlaggan, which is about three miles in circumference, the ruins of the castle or palace of the Macdonalds, lords of the isles, are yet visible.

The rocky strata of Islay present much that is interesting and instructive to the mineralogist. The highest mountains are composed of granular quartz, and the same rock is seen at the precipitous headlands on the east and west side of the island. Micaceous schistus is distributed along the sides of the mountains at a lower elevation, and in the central districts a great body of limestone stretches almost throughout the whole extent of the island. Extensive masses of hard marl are connected with the limestone, and from its disintegration a good deal of soft marl is carried down and deposited in the low grounds. A great body of syenite forms the north side of the harbour of Lochindaal, and extends to the point of the Rinns, where it is seen connected with a beautiful porphyry, which may vie with the fine green porphyry from Egypt. The strata enumerated are frequently traversed with basaltic veins, or whin-dykes, of great thickness and extent. Veins of lead ore are distributed in the lime-stone, and one of the principal of these veins has a whin-dyke for its wall or boundary on one side. The lead mines of Islay, it is supposed, were wrought as early as the time of the Danes, and were lately in a state of activity.

Some of the rare indigenous plants are natives of Islay. The red and black currant, *ribes rubrum,* and *nigrum,* appears among the brush-wood on the banks of the sound and in the central districts of the island; *convolvulus soldanella,* sea bind-weed, displays its specious flowers on the sandy shores of Laggan bay; *crambe maritima,* sea-kale, grows luxuriantly on an island near the coast at Ardneave; common chamomile, *anthemis nobilis,* is so abundant on an islet near the east coast that it covers great part of the surface, and forms a thick sward, to the exclusion of every other plant; and the purple flowers of *anagallis tenella,* bog pimpernel, are a fine ornament to the marshy grounds in many places.

The surrounding seas abound with a great variety of excellent fish, and the same birds and quadrupeds are common in Islay that are found in similar districts on the main land, with the exception of the fox, to whose depredations the inhabitants of Islay are yet strangers.

The population of Islay is about 9000, and the inhabitants are chiefly employed in agriculture and fishing. *Bowmore,* which stands on the east coast of Lochindaal, is the only town of the island; contains about 1000 inhabitants, is regularly built, has a fine church, which forms a conspicuous object, and is furnished with a pier at which small vessels can discharge their cargoes.

Mr Campbell of Shawfield is the principal proprietor; and indeed only two other proprietors, Mr Campbell of Balinabby, and Mr Campbell of Sunderland, hold any part of the property of the island. The favourable climate, fertile soil, and abundance of manure, have encouraged the spirited efforts of both landlords and tenants in carrying on very essential agricultural improvements, by draining, enclosing, and observing a suitable rotation of crops. The diversified surface of the island renders it favourable both for raising corn and grazing. Some wheat is raised, but the principal crops are oats, barley, and potatoes. Grain, potatoes, and flax are occasionally exported, as well as great numbers of cattle, which are in great estimation in the market, from the attention of the proprietors in improving the breed.

Jura.—The island of Jura is separated from Islay by a narrow strait or sound, in some places not more than two miles broad. The length of this island is 34 miles, and the average breadth about eight miles. Some of the mountains of Jura rise to a great height, and are not less than 3000 feet above the level of the sea. The west coast is rugged and precipitous, but the whole eastern side of the island is flat land, and great part of it is cultivated. The rocks of Jura are similar to those of Islay, and their distribution is nearly the same. The harbour of Small Isles on the east side admits vessels of moderate burden, and two regular ferries are established; the one on the east side of the island forms the communication with the main land, and the other on the sound of Islay forms the communication with that island.

Excepting two sheep farms, which belong to Mr M'Neil of Colonsay, Mr Campbell of Jura is proprietor of the whole island. The population is about 1200, and the inhabitants are employed in rural affairs, in fishing, or in the manufacture of kelp. Mr Campbell has of late years introduced many improvements in agriculture on the lands in his own immediate possession; his example has been successfully followed by many of his tenants; and the liberal grant made by government for making roads in the Highlands and islands, has enabled the proprietor very effectually to improve the roads of Jura, and to render the landing places at the ferries more safe and commodious. The improvement of the breed of cattle has not been neglected in Jura, and a good many are annually exported. Jura at one time was well stocked with deer, and about 150 head still roam in their native wilds in the western districts of the island.

The whole island forms but one parish, including also Colonsay, Oransay, Scarba, Lunga, and some other islands. Between Jura and Scarba lies the famous whirlpool of Corryvreckan; for an account of which see *Hydrography*, under GEOLOGY.

Scarba.—This island lies to the north of Jura, and is about three miles in length and two miles in breadth. It is chiefly composed of a mountain of an oblong form, which rises precipitately from the sea, especially on the west side, and is not less than 1500 feet high. Excepting on the eastern coast, where natural woods make their appearance, the surface is rocky and covered with heath. The geological constitution of this island is nearly the same as that of Islay and Jura. The chief part of the mountain is composed of granular quartz; micaceous and argillaceous schistus are found at lower elevations; and these strata are traversed by basaltic veins or whin-dykes.

Scarba contains about 50 inhabitants, who are chiefly employed in fishing and in the rearing of a few cattle and sheep.

Lunga lies to the north of Scarba, from which it is separated by a narrow strait, presents an uneven rocky surface, and consists of an irregular hilly ridge, scarcely reaching 1000 feet in height at its greatest elevation. It is nearly three miles long, and not more than one mile at its greatest breadth. Some natural woods appear in sheltered places; but the greater part of the surface is either marshy or covered with heath where the bare rock is not visible. In its geological character, Lunga resembles Scarba. The granular quartz appears on the western side, and a regular ridge of argillaceous schistus stretches along the eastern coast of the island, while these strata are traversed by numerous basaltic veins or whin dykes. The few inhabitants of Lunga, not exceeding 30 in number, are also occupied in fishing, or in the care of a few cattle and sheep.

Gigha and *Cara.*—These islands lie on the coast of Argyleshire, from which they are separated by a channel of 3½ miles in breadth, and on which a regular ferry is established. Gigha is about seven miles in length, and about two and a half miles in breadth. No part of these islands rises to a mountainous elevation; the highest hill does not exceed 400 feet; in their geological structure they are similar to Islay and Jura. A considerable proportion of the surface of Gigha is arable, and agricultural improvements have been successfully introduced.

Cara is about a mile long and half a mile broad, and is separated from Gigha by a channel about a mile and a half in breadth. This island is chiefly under pasture, and in one quarter rabbits are very abundant. The two islands form one parish, with about 600 inhabitants, who are occupied in the labours of agriculture or in fishing. In Ardmeanish bay, near the church, good anchorage is found in six or seven fathoms water, and for the largest vessels near a small island, in the middle of the sound, between Gigha and Cara.

Colonsay and *Oransay* are two islands which are separated from each other by a narrow strait, dry at low water. They lie to the westward of Jura, and are included in the same parish, and about nine miles north from Islay. The whole length is about 12 miles, of which Colonsay occupies 10 miles by 3 miles in breadth. Granular quartz is seen in some places, but the prevailing rock is micaceous schistus approaching to chlorite, and argillaceous schistus of a waved or undulated structure. Colonsay presents somewhat of a hilly aspect, although its greatest elevation is not more than 800 feet. Along the western shores of the islands, extensive beds of shell-sand have been thrown up, and the greater part of the surface of Oransay is covered with that valuable manure, which is not only applied to that purpose on the spot, but has been sometimes exported to the island of Islay. Agriculture has arrived at great perfection under the excellent system introduced by the present proprietor, who has also paid great attention to the improvement of the breed of cattle, which are held in high estimation in the market. The number of inhabitants exceeds 800. The extensive ruins of a monastery still remain in Oransay, and similar remains of religious houses are yet to be seen in Colonsay.

Shuna is situated between Luing and the mainland, is about three miles long and half a mile broad, presents an uneven surface, which is diversified with rocks and natural woods, pasture, and corn land. Like Jura and Scarba, the rocks are chiefly granular quartz, and argillaceous schistus, with some chlorite and hornblende schistus. Limestone appears at each extremity of the island, and like the other islands it is traversed with basaltic veins.

Luing, which is about five miles in length, and lies to the westward of Shuna; *Torsa* two miles in length to the eastward of Luing; *Seil* four miles long and two miles broad; and *Easdale*, a small island to the westward of Seil,—are distinguished by the name of *Slate islands*, because they are chiefly composed of argillaceous schistus or roof-slate, which has been long dug out and exported for economical purposes. The west side of Seil consists chiefly of trap rocks, and not far from its northern extremity it approaches so near to the mainland that a communication is formed by means of a bridge of a single arch. The islands now mentioned contain a considerable population, the greater part of which is employed in the slate quarries.

Kerrera is four miles long and two miles broad, and stretches along the mainland, forming a strait, half a mile broad, called the sound of Kerrera, in which ships find a safe and commodious harbour. Roof slate appears on the east side, but the island is chiefly composed of sand-stone, or sand-stone conglomerate or breccia, and trap rocks. The surface of the island is extremely rugged and uneven, for it is composed of hills, some of which exceed 1000 feet in height, separated by narrow vallies. But in many places it is covered with a fertile soil, and it affords excellent pasturage for sheep and cattle.

Lismore.—To the north of Kerrera is the island of Lismore, which is situated at the entrance of the Linnhe-loch, and is about eight miles long and one mile broad. The rocks of this island are entirely composed of lime-stone, which, in its general character and distribution, resembles the lime-stone of Islay, and is traversed by basaltic veins. The soil, from the nature of the rocks, has been always celebrated for its fertility, and particularly for the production of luxuriant crops of barley. The population exceeds 1000, and the inhabitants are employed in agriculture, quarrying and burning lime-stone for the supply of the neighbouring coast and islands, and in fishing.

Lismore was formerly the seat of the bishop of Argyle, the remains of whose castle are still visible, and part of the cathedral is occupied as the parish-church. A college for the education of the clergy of the Roman catholic persuasion is established in this island.

Mull.—This island is very irregular in its outline, is nearly 30 miles in length along its southern coast, and about 25 miles from north-west to south-east; and is deeply indented by several arms of the sea, particularly on the west side, two of which stretch far into the interior. On the east it is divided from the mainland of Morven by the narrow strait called the sound of Mull. In the promontory of Ross, at the western extremity, primary rocks appear, chiefly composed of beautiful red granite. But the greater part of the island consists of basaltic rocks, which form lofty precipices to the west, and often exhibit that rock in a regular columnar form. Some of the mountains rise to the height of 3000 feet; and the surface falls with a gentle declivity towards the eastern shore. A few thin veins of coal have been detected in the trap rocks; but the nature of the rocks forbids the hope of finding that valuable fuel in such quantity as to render it worth working. Mull is destitute of wood on the western side; but some plantations on the eastern shore are in a thriving state. In many places the soil of this island is fertile, and produces excellent crops of different kinds of corn; but the greater part of the surface, from its elevation and rugged aspect, is devoted to pasturage.

The population of Mull, including Icolmkill, Ulva, and some smaller islands, exceeds 8000. It is divided into three parishes; the principal village, Tobermory, is near the north-eastern extremity, and was selected by the trustees for fisheries as a convenient station, on account of its excellent harbour, for facilitating the herring fishery on the west coast. It was founded in 1789, but it has scarcely made any progress in extent since its first establishment. Some smaller villages are scattered in other parts of the island. At the south-eastern extremity is castle Duart, situated on a bold promontory, once a formidable stronghold of the powerful family of Maclean, but now in ruins.

Icolmkill, or *Iona*, separated from Mull by a narrow channel, is about three miles in length and one mile in breadth. On the west side it is rugged and rocky; in the middle it rises into irregular elevations; and on the east side it is flat. The highest hill is not more than 350 or 400 feet. The prevailing rock in this island is said to be argillaceous schistus, with a small portion of the beautiful red granite of which Nun's island and part of the opposite coast of Mull is composed. On the south side of the island a compact feldspar and marble, which was formerly wrought, are found. Steatites and serpentine, connected with marble, are also enumerated among the minerals of Iona.

The population of Iona exceeds 400; and the inhabitants are employed in the labours of agriculture, in fishing, or in the manufacture of kelp. The plain on the east side of the island, on which stands the village, is the only part under cultivation; and the chief crops are barley and potatoes.

But Iona has acquired its greatest celebrity as having been at one time, as Dr Johnson expresses it, "the luminary of the Caledonian regions, whence savage clans and roving barbarians derived the benefits of knowledge and the blessings of religion." Columba, the patron saint of this island, it is said, left his native country, Ireland, about the year 565, for the purpose of preaching Christianity to the Picts; and, having succeeded in the conversion of the Pictish monarch, he was rewarded with the property of the island, in which he established a religious order. The original buildings for the accommodation of the monks were of wood, although, from an erroneous view of the progress and state of architecture, it is alleged that some part of the edifices, the ruins of which now remain, were erected in the time of Columba. It seems indeed extremely improbable that any part of the present buildings can claim a higher antiquity than the twelfth century; and it is even supposed by some, that they were not in existence before the thirteenth century. The abbey church, which was the cathedral of the diocese of the Isles, is built in the form of a cross; the length from east to west is nearly 120 feet, and the transept is 72 feet; and the tower, which consists of three stories, is supported by four arches at the intersection, and rises to the height of 70 feet. This edifice is not destitute of ornament, although in a plainer style than many similar structures which have been indebted for their existence to the piety of richer votaries. Great part of the building is constructed of the granite from Nun's island, excepting the carved work, which is executed in sandstone, and the roofs, consisting of micaceous schistus. The remains of the bishop's house are still visible to the north of the cathedral; and a small chapel, dedicated to St Oran, lies on the south; and at a short distance from the latter is the burying-place of Oran, in which are many tombs, but few of the inscriptions are now legible. In such high veneration was this spot held, that it was chosen as the sanctuary for the mortal remains of 48 kings of Scotland, four kings of Ireland, and eight kings of Norway, as well as persons of the first rank in the isles; and, if tradition is to be trusted, the ashes of one king of France repose in the same sanctuary. The date of the earliest tomb yet visible is 1489; the date of the tomb of an abbot, which is in the choir of the cathedral, is 1500, and that of a prioress 1511. At some distance to the southward are the ruins of the chapel of the nunnery, which is supposed to be a structure of greater antiquity than the cathedral. A broad paved way, called the Main street, extends from the nunnery to the cathedral; and of 360 crosses, which it is said once adorned Iona, three only remain,—one of which stands near the Main street, and consists of a single stone of micaceous schistus, covered with well-executed ornamental sculpture. To secure these venerable ruins from farther dilapidation, the proprietor of the island, the duke of Argyle, within these few years, has laudably enclosed them with a stone-wall.

Ulva, *Gometra*, and some other smaller islands, situated on the west side of Mull, are similar in geological structure to the adjoining coasts of that island; and *Inch Kenneth*, which is composed of sandstone, still exhibits the remains of a religious establishment.

Staffa, directly west from Inch Kenneth, has acquired greater celebrity on account of the regularity of the splendid colonnade of basaltic columns along the south and west sides. Staffa is not more than a mile in length, and scarcely half a mile in breadth. The rocks are entirely of a basaltic nature; and the surface, which is little more than 200 feet above the level of the sea at the highest point, is covered with pasture which supports a few sheep and cattle during the summer. On the south side of the island the basaltic pillars are curved in different directions, and some are nearly horizontal. But on the approach to the cave of Fingal, a magnificent colonnade commences, and the pillars of which it is composed are of large size and in a perpendicular position. The width of the cave at the entrance is 53 feet, the height 117 feet, and the length 250 feet. The height of the cave is 70 feet at the extremity; and the height of the tallest columns on the right side of the entrance is 45 feet. This remarkable natural curiosity, although not unknown in traditionary history, was first noticed by a Mr Leach, an Irish gentleman, who being on that part of the coast had examined it during a fishing excursion, and communicated the information to Sir Joseph Banks, who was at that time, in the year 1772, on his return from a voyage to Iceland, an account of which appeared in "Letters on Iceland," by Von Troil. It was immediately visited by that naturalist and his friends; and his observations being communicated to Mr Pennant, were first published in his "Tour to Scotland." Those who have described this remarkable production of nature seem to have been animated with the most rapturous enthusiasm. "When we behold," says Von Troil, "the cave of Fingal formed by nature, it is no longer possible to make a comparison; and we are forced to acknowledge, that this piece of architecture, formed by nature, far surpasses that of the Louvre, that of St Peter at Rome, all that remains of Palmyra and Pœstum, and all that the genius, the taste, and the luxury of the Greeks were capable of inventing." The incorrectness of this description must be obvious, from a comparison being made between objects which have no alliance with each other. But the description of Faujas de St Fond is less tumid and more appropriate. "I have," says that naturalist, "seen many ancient volcanoes, and I have given descriptions of several superb basaltic causeways and delightful caverns in the midst of lavas; but I have never found any thing which comes near to this, or can bear any comparison with it, for the admirable regularity of the columns, the height of the arch, the situation, the form, the elegance of this production of nature, or its resemblance to the master-pieces of art, though this has had no share in its construction. It is, therefore, not at all surprising that tradition should have made it the abode of a hero."

Another cavern on the north side of the island, which is on a smaller scale, is known by the name of the Corvorant's cave. It may be added, that Staffa can only be visited in moderate weather on account of the heavy swell that sets in from the Atlantic ocean. But the mineralogist who is so fortunate as to have the command of a few hours to prosecute his researches, will be rewarded with some beautiful specimens of different varieties of zeolite in the amygdaloid which alternates with the columnar basalt.

Coll, which lies north-west from Mull, is about 12 miles long, and scarcely three miles broad. The rocky shores are interrupted by sandy bays; and the surface, in many places, presents rocky elevations, interspersed with green spots, which are susceptible of cultivation, or fit for pasture; and in the central districts numerous small lakes are distributed. The rocks of this island are chiefly composed of gneis, which, in the arrangement of its constituent parts, approaches very nearly to granite. Hornblende is found to be one of the ingredients of the gneis, but sometimes it is wanting as well as the quartz, and pure feldspar remains behind; and, on the other hand, when it is destitute of the feldspar, the change is into hornblende rock. The gneis, which is much waved and twisted, is traversed by veins of granite. The strata are also sometimes, but rarely, traversed by basaltic veins or whin-dykes; and a thin vein of lead ore has been discovered, but no attempt has been made to turn it to a profitable account by working. The researches of the botanist will be rewarded with the discovery of some plants which are not common in every part of Scotland; among which may be mentioned several species of orchis, *ophrys ovata*, common twayblade, *satyrion hircinum*, lizard satyrion, *crambe maritima*, sea-kale, the specious water-lily, *nymphæa alba*, and the rare *eriocaulon septangulare*, jointed pipewort, whose only other habitat in this country is confined to the isle of Skye.

The population of Coll is about 1200; and the inhabitants are chiefly employed in agriculture or fishing. Considerable agricultural improvements have been introduced by Maclean of Coll, the resident proprietor of the central districts; and his example has been laudably followed by the tenants. The chief produce of the cultivated soil is barley. The shell-sand, which is sometimes blown up into masses forming banks and hills, is employed as a valuable manure.

Tirie, which lies to the westward of Coll, is separated by a channel, at its narrowest part not more than half a mile broad, is about 12 miles long, and, at its western extremity six miles broad. This island presents a flat surface, excepting towards the southern extremity, where it is diversified by a few hills, one of which rises nearly to the height of 400 feet. Like Coll, the shores of Tirie are indented with sandy bays, which are separated by ridges of rock; and at the northern extremity accumulations of sand are produced by the force of the wind, which sometimes sweeps with great violence over the whole unprotected surface of the island.

The principal rocks of Tirie consist of gneis, and indeed it may be considered as forming a part of Coll, with the exception of a beautiful marble on the north side, which has been sometimes applied to architectural purposes. This marble is known for its delicate flesh colour interspersed with green spots of serpentine.

Tirie is included in the same parish with Coll and some smaller adjoining islands; and the amount of the whole population is stated at more than 3000; so that, if this estimate be correct, Tirie contains a larger proportion of inhabitants than Coll. They are employed in the manufacture of kelp, in fishing, and in agriculture. The principal produce of the soil is barley, with some oats, potatoes, and flax. The rearing of black cattle for exportation is an important branch of the rural economy of Tirie and the neighbouring island.

Muck is a small island lying to the north of Mull and Ardnamurchan, and is about two miles long and one mile broad. The coast is rocky and indented with small bays, which afford shelter for fishing-boats, but no safe harbour for vessels. The island presents a waved surface, and at the west end rises into a hill of 600 feet in height. The rocks are entirely composed of basalt, which often assumes a columnar form. In one spot on the coast a small extent of limestone and sandstone appears. The island contains about 200 inhabitants, who are chiefly employed in the cod and ling fishery or in the rearing of black cattle, for which the island furnishes excellent pasture.

Egg or *Eigg* lies north-east from Muck, is about four miles long and two miles and a half broad, and is surrounded almost every where with a rocky shore, excepting the sandy bay of Lag on the west coast. The surface is generally diversified with small hills and terraces, but, towards the south side, it rises to a mountainous elevation in the rock called the Scuir of Egg, which is more than 1300 feet in height. The whole of this island is composed of trap rocks, excepting a small portion of sandstone and limestone, in the first of which fragments of coal are observed. This island exhibits some fine colonnades of basaltic columns, and, at the south-eastern side of the island, two veins of pitchstone, within a few yards of each other, traverse the rocks. They vary in breadth from three feet to less than an inch. Part of the Scuir of Egg, already noticed, is composed of pitchstone porphyry, and the amygdaloid or amorphous basalt affords some fine specimens of zeolite and calcedony.

The number of inhabitants in this island is estimated at 400. The rearing of black cattle is the principal object of their rural economy; but some of the soil near the bay of Lag, and on the opposite side of the island where it is flat, is under cultivation. Fishing also, as in the other islands, is a branch of their industry.

Rum lies north-west from Egg, is about eight miles long and nearly of the same breadth. The surface is mountainous and rocky, and rude and barren in its aspect. Some of the mountains exceed 2000 feet in height. The higher parts of this island are frequently involved in mist, and it is subject to frequent rain and storms. Very little of the surface is under culture, so that the rearing of black cattle and sheep are the chief objects of rural economy. The population of the whole island is not equal to 400. Along the northern, eastern, and south-eastern coast of Rum the rocks are sandstone and syenite, but a large proportion of the island is composed of trap rocks.

Canna, which lies to the north-west of Rum, exceeds four miles in length and is about a mile in breadth. On the north side it is bounded by precipitous cliffs, and on the south side it declines towards the shore. The highest land is about 800 feet above the level of the sea. The greater part of the surface is covered with excellent pasture, and on the low grounds a good deal of the soil is under cultivation. The rocks of this island are entirely of a basaltic nature, either in a columnar or amorphous form, and the cavities of the amygdaloid furnish all the varieties of zeolite. On the shores of the island are observed beds of conglomerate trap, alternating with the columnar basalt. This conglomerate or breccia contains masses of sandstone and fragments of bituminous wood. The basaltic rocks of Canna, as has been often observed in other places, disturb the direction of the magnetic needle; and from this effect one of the hills has received the appellation of Compass-hill. The ruins of an ancient castle on the summit of an insulated rock still remain.

The population of Canna is stated at 300. The greater part of the island is under pasture. Barley, oats, and potatoes are the chief cultivated products; but the inhabitants are much employed in fishing, on which they depend for a considerable part of their subsistence.

Sandy isle, which may be considered as a part of Canna, as they are united at low water by a bank of shell-sand, forms with it an excellent and secure harbour, which is often frequented by ships navigating those seas during the prevalence of contrary winds. On that side of the island next to Canna the surface is low, but on the opposite side it rises into gentle elevations, which terminate in precipitous cliffs. The rocks of this island are similar to those of Canna, and the alternations of the basalt with the conglomerate or pudding-stone are more conspicuous; and detached fragments of red sandstone are found on in this island, and the rest of the surface is devoted to the pasturage of cattle.

Skye is the largest of the chain of the western islands which lies next to the mainland, is about 45 miles in length, at its greatest breadth 24 miles, and not more than 15 miles at its average breadth; is bounded in most places by a rocky and precipitous coast; and presents a very unequal surface, which often rises to a mountainous elevation. Skye is deeply indented with arms of the sea, particularly by loch Snizort and loch Fallart on the north-west coast. Many of these bays and lochs afford good anchorage and shelter during bad weather; and Portree on the east, and isle Oransay on the south-east, are safe and commodious harbours. The greater proportion of the rocks of Skye are of a basaltic nature, and some of them assume a regular columnar form. But primititive rocks, as gneis, argillaceous and chlorite schistus, quartz, and syenite, are abundant in the southern part of the island; marble, of an excellent quality, is met with, as well as limestone, and a considerable extent of sandstone, forming lofty cliffs, skirts the shores of the districts to the north-east. In the fissures of the basaltic rocks are numerous caves, some of which are filled with stalactitical concretions of lime-stone. The *spar-cave*, as it is called, because the stalactitical deposition is white and pure, has acquired great celebrity from recent descriptions, and is situated in one of these fissures in the district of Strathaird on the west side of loch Slapin. The most elevated land of Skye is in the southern districts, where several of the mountains rise to the height of 2000 feet, and some are not less than 3000 feet above the level of sea. The summits of these mountains are frequently involved in mists and clouds, which seems to have suggested the ordinary name of the island, as well as the poetical designation, *Isle of Mist*, of the Gaelic poet. Excepting in sheltered spots in the eastern and southern districts, few natural woods now exist in Skye; but in some parts of Lord Macdonald's property extensive plantations have been laid out.

Numerous remains of circular buildings, the construction of which is usually ascribed to the Danes, for the purpose of strong-holds, are still visible on different parts of the coast. Druidical temples, composed of ranges of single stones in a vertical position, are also found; and cairns, consisting of an immense accumulation of stones, occupy the summit of some of the highest hills. Some remains of ancient castles, the residences of powerful chieftains, still exist.

Skye is divided into seven parishes; and the amount of the population of the whole island is stated at 15,000. From the nature of the surface, Skye is more adapted to pasturage than tillage, so that the rearing of cattle for the English market occupies a larger share of the attention of the inhabitants than the cultivation of the soil. But the low grounds near the coast, when properly managed, afford excellent crops of oats, barley, and potatoes. As in the other islands, many of the inhabitants are employed in the fisheries and in the manufacture of kelp.

Scalpa is an island on the east side of Skye, and is about three miles long and two miles broad. The rocks of this island are chiefly composed of lime-stone, abounding in animal remains, and alternating with sandstone, syenite, argillaceous and feldspar porphyry; and these strata are traversed by numerous veins of basalt. As no part of the island rises to any great elevation, it affords good pasturage for cattle; and from the low grounds under tillage, excellent crops of barley, oats, and potatoes, are obtained.

Rasay, which lies to the northward of Scalpa, exceeds 12 miles in length, but it is not more than three miles in breadth. The eastern shores are mostly bounded by precipitous cliffs, but on the west it declines generally towards the sea. The surface is uneven, and often rises to the height of 1000 feet; and Dun Can, the loftiest summit, is supposed not to be less than 1500 feet above the level of the sea. Gneis is the prevailing rock in the northern part of the island. To this succeeds a breccia or conglomerate, on an elevated summit of which, about the middle, and on the east side of the island, is erected Brochel castle, formerly the residence of the proprietors of the island, but now in ruins. In the southern part of the island are found red and white coloured sandstone, micaceous shale, containing organic remains, limestone, and porphyry, on the west side of the island. The summit of the loftiest hill in the island is composed of basalt, which appears also in other places, and traverses the other strata in the form of veins.

Along the eastern shore are seen numerous cultivated spots and occasional patches of coppice wood, diversifying the uniformity of the heathy surface or green pasture lands. In the vicinity of the mansion of the proprietor, Mr Macleod, the land is under excellent cultivation, and produces good crops. The trees surrounding a ruinous chapel near this spot, and which have grown to a large size, afford satisfactory proof that plantations properly enclosed and sheltered would thrive well in many places of the Hebrides which are now destitute of wood.

Rona is separated from Rasay by a narrow strait on the north, and belongs to the same proprietor. The rocks of this island are entirely of the primitive class, and consist of gneis. The length is about five miles, and the breadth one mile, and it is entirely devoted to the pasturage of black cattle. Several harbours on the west side afford safe shelter to small vessels.

Long Island.—Under this general denomination is included the outer chain of the Hebrides, comprehending *Bernera* or Barra head at the southern extremity, Barra, South Uist, Benbecula, Harris, and Lewis, beside a great number of smaller islands along the coast, or in the sounds or channels which separate the larger islands. The course of this chain is nearly parallel to the main land, and extends from nearly opposite to the north end of Mull 120 or 130 miles, to a point not far from the parallel of Cape Wrath. In their geological structure these islands exhibit nearly the same character. The rocks are chiefly composed of gneis or granite, and a similar distribution is observed throughout the whole range. *Bernera*, or *Barra head*, which exhibits a bold headland, and is a convenient land-mark to mariners, is about five miles in circumference, and contains some fer-

Hebrides. tile soil and good pasturage. It is the most southerly of the whole chain. To Bernera, proceeding northward, succeed Mingala, Pabba, Sandera, Vatersa, and some smaller islands.

Barra is about eight miles long and four miles broad, very irregular in its form, and skirted with numerous smaller islands, especially on the east side. The inhabitants are employed in the rearing of cattle and raising a little corn, but chiefly in the manufacture of kelp, and in the cod and ling fishery, the produce of which latter they carry in their own boats to the Glasgow market, for which purpose they undertake a long and circuitous voyage. The population of the parish, which includes several of the smaller islands in its vicinity, is about 2000.

South Uist, to the north of Barra, exceeds 30 miles in length and about nine miles in breadth. It is deeply indented by arms of the sea both on the east and west sides, some of which are good harbours and commodious fishing stations. Towards the east side the surface is hilly and chiefly covered with heath, but on the north and west some tracts of a light and sandy soil are under culture. The population exceeds 4000, and many of the inhabitants are employed in the manufacture of kelp, of which it is stated 1100 tons are annually produced.

Benbecula, which lies between South and North Uist, is about eight or nine miles in length from east to west; and, being deeply indented on the south side, is of variable breadth. The remains of a Danish fort and of Druidical temples are yet visible. This island is included in the parish of South Uist, and a good deal of kelp is manufactured on the shores.

North Uist, which lies to the north of Benbecula, and from which it is separated by a narrow channel dry at low water, is about 20 miles in length and from 12 to 18 miles in breadth, deeply indented by arms of the sea, and presenting in most places a bold rocky shore, which is skirted with numerous islands. Some of the bays, and particularly loch Maddy, which can admit vessels of any burthen, are safe and commodious harbours. The western and northern districts are low and flat near the shore, and covered with a sandy soil, which is susceptible of culture, and sometimes affords good crops of barley, oats, and potatoes. The quantity of kelp annually manufactured is stated at 1200 tons. This island, with a number of others, forms one parish, the population of which exceeds 3000.

Harris is separated from North Uist by the channel or sound of Harris, which is filled up with a number of smaller islands, and it is separated from Lewis by a narrow isthmus formed by the approach of two arms of the sea, loch Resort and loch Seaforth. The length of this island is estimated at 25 miles, and the breadth varies from six to eight miles. It admits of a natural division by East and West Tarbert, which approach within a quarter of a mile of each other. The northern district is called the *Forest*, although now destitute of wood, because it is the resort of the red deer, and it is supposed was once a royal forest. The surface of the island is extremely uneven and rugged; but the valleys afford tolerable pasture, and the low grounds near the shores and harbours afford crops of barley, oats, and potatoes, which, it is said, are sufficient to support a population which exceeds 3000. The shores furnish a great deal of sea-weed, which is manufactured into kelp. Hebrides.

Lewis, which forms the northern extremity of the outer range of the Hebrides, is about 40 miles in length, and from 12 to 15 miles in breadth. It is deeply indented on all sides by arms of the sea, some of which form safe harbours. The surface of this part of Lewis is less rugged and mountainous than the southern division, described under Harris; but many of the less elevated tracts are covered with lakes, mosses, and swamps. The low land on the coast is arable, and, although a light or sandy soil, produces good crops; but the rearing of black cattle, sheep, and the fisheries, chiefly occupy the industry of the inhabitants. Red deer are still enumerated among the wild animals of this island; and that district to which they chiefly resort yet retains the name of the forest, although, like the neighbouring division of Harris, no trees are found to entitle it to that character. Numerous remains of antiquity, as duns, castles, and Druidical temples, still exist. The population of the island, which is divided into four parishes, exceeds 9000. They are chiefly scattered over the island, or collected in several small villages, or in the town of Stornoway, the largest and most populous in the whole extent of the Hebrides.

Stornoway stands at the head of a bay of the same name on the east side of the island, is well built, and laid out with pretty regular streets; and beside the church and school-house, is provided with a custom-house, post-office, and assembly-rooms—a proof of the trade and amusements of the place. A regular packet sails weekly to the mainland. The town contains about 800 inhabitants, many of whom are employed in prosecuting the white and herring fisheries. The harbour of Stornoway is of easy access, safe and commodious, and is much frequented by ships overtaken with bad weather or detained by contrary winds. The vicinity of the town is adorned with Seaforth Lodge, belonging to the Seaforth family, by whom the property of the island is held.

Shiant isles are three small islands which lie at a short distance from the east coast of Lewis, and are composed of basaltic rocks, which in many places exhibit a regular columnar form, and the surface is covered with verdure, which affords pasturage to sheep under the care of a shepherd, whose family constitutes the only inhabitants. The remains of a building which is supposed to have been a religious house are yet to be seen. The inaccessible rocks of these islands are tenanted by innumerable flocks of sea-fowl.

Flannan Isles.—These islands, which are seven in number, are about 17 miles distant from the nearest point of Lewis to the westward. They are composed of the same kind of rocks as the Long island, and some of them are stocked with sheep, for which they furnish excellent pasturage. But the chief produce is in feathers, obtained from myriads of sea-fowl by which they are frequented.

North Rona, which lies in north latitude 59° 9′, and in west longitude 5° 42′, is the most northerly of all the Hebrides, and is also composed of gneis, which alternates with hornblende schistus, and these rocks are traversed by veins of granite. The length of this island is not more than a mile and a quarter, and the breadth about half a mile. It is surrounded by precipitous cliffs, which in some places rise to a considerable elevation, and contain numerous spacious caverns. This island, so far removed from the habitable world, is occupied by a single family, consisting of six individuals, the husband, the wife, three children, and the wife's mother, who has spent 40 years of her life in this secluded spot. It may surprise an inhabitant of the south, to be informed that Rona is let to a tacksman of Lewis for L.2 Sterling a year, and for this he receives from the immediate occupant eight bolls of barley, eight stones of feathers, and the produce of the sheep. But it ought to be recollected, that relative position and diversity of circumstances greatly change the value of things. Beside barley, the soil produces oats and potatoes, and with this produce, the milk of a cow, and the animal food obtained from sea-fowl and cuddies or coal-fish, the family is supported. Clothes, to the amount of L.2 Sterling value, are the only annual allowance for his labour, and, what many will probably be disposed to add, his voluntary exile. Twice in the year he is visited by a boat from Lewis in which the produce is carried away, and this is all the intercourse which this family has with the world; yet no indications of murmuring or discontent appeared; and the only desire expressed by the head of the family, when the island was visited by Dr Macculloch, from whom this account is taken, was to have his two younger children christened,—and for this purpose he contemplated a voyage to Lewis as soon as the period of his engagement of eight years was completed, of which seven had expired.

Sulisker is another island which lies to the southward of Rona, appears to be similar in its geological structure, is much smaller in extent, and is only the abode of sea-fowl, among which the gannet or solan goose is the most numerous. As it is included in the same property with Rona, it is visited in the spring by the tenant from Lewis for the purpose of procuring feathers.

St. Kilda.—At the distance of nearly 20 leagues westward from the nearest point of Harris, St. Kilda may be considered as the remotest settlement of the British empire in immediate connection with the mother country. This seclusion from the world seems to have excited at all times eager curiosity to be acquainted with the character and manners of its inhabitants, and perhaps has given rise to some of the exaggerated and incredible descriptions which have appeared of this sea-girt spot. Besides the island of St. Kilda properly so called, and on which the whole population is collected in a single village, several other islands are included in the same groupe, and such as are accessible afford pasturage for sheep, or furnish sea-fowl, which are caught for the purpose of food, or for the sake of the feathers. The length of St Kilda is about three miles, and the breadth about two. The summit of the highest mountain exceeds 1300 feet. The rocks, which present bold precipitous cliffs all round the island excepting at the bay or landing place near the village, and one or two other places, are composed of syenite and basalt, the latter of which sometimes appears in the form of veins. The surface of the island, even at the greatest elevation, is covered with fine verdure, and supports sheep, black-cattle, and a few horses. The whole extent of the ground under culture is in the immediate vicinity of the village, and the usual crops are barley, oats, and potatoes. On account of the tremendous storms to which these islands are subject, the houses are built low, and even the floor is sunk under the surface of the ground. The doors of the houses are furnished with a wooden lock and key, constructed exactly in the same manner as the lock and key employed by the African negroes in the West Indies,—a singular coincidence, which was either unknown or has passed unnoticed by the historians or visitors of St Kilda. On the rising ground above the village are constructed many small buildings of a hemispherical form, for the purpose of storing their fuel, which consists of turf cut from the side of the hill, and hay, corn, and sea-fowl for their winter stock.

The population of St Kilda, which in 1799, when we had an opportunity of visiting that island, amounted to 120, had diminished in 1816 to 103 individuals. It appears that the number of inhabitants has been at different times much greater, but was greatly reduced by the ravages of the small-pox, which at one period threatened to depopulate the island. Bird-catching is the chief employment of the inhabitants, and in this perilous employment they discover a very adventurous spirit. From this occupation they derive a large proportion of their winter's provision, and feathers, which are considered one of the valuable products of the island.

The inhabitants of St Kilda are now in more favourable circumstances than formerly, when the island was let to a tacksman, who, it might be naturally expected, was not always scrupulously attentive to the advantage and comfort of his sub-tenants, where his own interest was so deeply concerned. The property of St Kilda, we believe, is now held by a native of the island, who, it is understood, has greatly improved the condition of the inhabitants. The rent is L.40 Sterling a-year, and it is paid in feathers, wool, cheese, and butter; and what can be spared of these commodities beyond what is necessary for themselves is conveyed to the Long Island, and disposed of for what clothes or domestic implements they require, and for this purpose they make a voyage once or twice in the year.

In the performance of their religious duties, the inhabitants of St Kilda are assisted by a catechist or clergyman, appointed by the Society for the Propagation of Christian Knowledge in Scotland, with an annual salary of L.35. The service is performed in the steward's house, which is the most spacious, and of the largest dimensions of any in the village. Christ's-church, at a short distance, of which little more than the foundation was visible a few years ago, has probably not been in use since the era of the Reformation. But these ruins, as well as the name of the island, afford proof of the existence of a more regular religious establishment in former times.

St Kilda is so rarely visited, that the arrival of strangers is regarded as a remarkable era in its history. On such occasions, the inhabitants, it is said, are generally seized with a cold. This singular, and seemingly inexplicable occurrence, which is gravely told by their historians, and is firmly believed by the natives themselves, has been discredited by others, and regarded as a ludicrous story. In one case, at least, and probably in similar instances, it seems not difficult to account for such an occurrence. The appearance of an armed vessel, as in the case alluded to, naturally excites alarm; the females retire to the mountainous districts; and the males remain, either to defend themselves, or, when this is impracticable, to receive the strangers, and if they prove friends to assist them in landing. During our visit to St Kilda, no eye was closed for more than 24 hours; the women were all night in the fields, and the men had made two voyages in their boat to the ship, which was far out at sea; so that this unusual exertion and long exposure to the open air might produce the symptoms of such affections as come under the denomination of *cold*, even among these hardy islanders.

Much has been said of the music and poetry of St Kilda, which no doubt possess the same character with what prevails throughout the other islands of the Hebrides. But it is not a little singular, that the poetical compositions of the natives of St Kilda are usually ascribed to the women. They are descriptive of those scenes and events which occur to themselves, and are sometimes distinguished by a fine strain of simplicity and tenderness. The following specimen, translated into elegiac verse, is, perhaps, not destitute of that character. It is said to be the production of a young woman for the loss of her husband:

Grief is my lot, forever shall I mourn;
  My cheek is furrowed with the tear of woe.
No gleam of joy to me shall e'er return;
  The calm of peace I never more can know.
Along the bosom of the troubled deep,
  Swift to the northern isle the frail bark glides;
A furious blast rush'd from the mountain steep,
  And plunged my husband in the foaming tides.
Each rising morn new woes to me are told,
  Since death in terror made the deep thy grave;
Each rising morn my weeping eyes behold
  The fatal spot where danger met the brave.
'Tis not for pining want I make my moan,
  My flocks destroyed, that now I weep and mourn;
But thee, my love, thy early fate alone
  I now bewail, forsaken and forlorn.
Now cold and lifeless is thy manly form,
  The restless ocean is thy watery grave,
The cruel sport of every ruthless storm,
  Thy limbs are shrouded in the whitening wave.
Deep sorrow has assailed me in thy fate,
  An early victim to affliction's doom:
Few years have mark'd my fleeting life's short date!
  The flower is blasted in its opening bloom.
But who, of mortals, pitiless could bear,
  What weeping mother would not weep and mourn,
To see their offspring, rear'd with tender care,
  The slave of strangers, hapless and forlorn?
'Tis thus with grief my sorrowing heart is torn,
  Swelling the anguish of my painful wound;
With labour hard my feeble hands are worn,
  The heavy pannier sinks me to the ground.

A fuller detail of the history of St Kilda will be found in the works of Martin and Macaulay, to which both are exclusively appropriated. For an account of the other islands of the Hebrides, Pennant's *Tour through Scotland* may be consulted, in which, it ought to be observed, superstitions are described at length which no longer exist among the Highlanders; and those who wish to be acquainted with the geological structure of these islands, will find ample information in Dr Macculloch's *Description of the Western Islands of Scotland*, in which also are introduced many judicious observations on other topics connected with the agriculture, domestic economy, and manners of the inhabitants.

HEBRIDES, NEW, a groupe of islands in the Southern Pacific ocean, which extend nearly 400 miles in a direction from north-west to south-east, and included between the 15° and 20° of south latitude, and between 166° and 170° of east longitude. Some of these islands were discovered by a Spanish navigator at the commencement of the 17th century; they were visited by Bougainville, the French circumnavigator, in 1768; and, in 1774, were more particularly surveyed by captain Cook. About 20 islands have been enumerated, some of which are more than 60 miles in length, and exceed 30 miles in breadth. In some of them volcanoes were observed, from which fire and smoke issued, and large stones were projected in the air; and, as happens in other volcanic countries, hot springs are found. Vegetation is extremely luxuriant; some of the trees grow to an immense height; and all the tropical fruits are abundant. Hogs and rats were the only quadrupeds observed. The feathered tribes, adorned with most beautiful plumage, swarm in the woods; and the surrounding seas afford plenty of fish, many of which it is said, but perhaps with no good reason, are poisonous.

The inhabitants of the New Hebrides are supposed, from having a different language from the natives of the other South Sea islands, to bespeak a different origin, and this origin is derived by some from Papua or New Guinea. They are distinguished also from most of the other South Sea islanders by long heads and flat faces, and particularly by wearing a belt or cord round the waist, by which their bodies are almost divided into two; and it is said they are not less distinguished by their honesty and hospitality.

HECATOMB, derived from the Greek, and signifying, according to some, *a hundred oxen*, which were sacrificed on solemn occasions among the ancients. Such a sacrifice is said to have been performed by Pythagoras when he discovered the demonstration of the 47th proposition of the first book of Euclid. The origin of the hecatomb is traced by some to the practice of the cities of Laconia, 100 in number, each of which furnished a bullock, for a general sacrifice; while others think that it is to be referred to a plague with which 100 cities of Peloponnesus was affected, and, to avert this calamity, each city supplied a bullock for a common sacrifice.

HEDERA, Ivy, a genus of plants belonging to the Pentandria class, and of which *hedera helix*, common ivy, is a well-known native of this country; and *hedera quinquefolia*, a native of Virginia, is an excellent plant for covering old walls.

HEDWIG, John, a celebrated botanist, was a native of Transylvania, and was born in 1730; began very early to discover a predilection for the study of plants, and received his medical education at Presburg and Leipsic. At the latter place, through the friendship of the professor of botany, he was entrusted with the charge of the garden. Having settled at Chemnitz as a medical practitioner, he employed his spare time in the collection and examination of plants, and particularly of those plants which belong to the Cryptogamia class. He removed to Leipsic in 1781, and in the succeeding year published in Latin his Natural History of Mosses; and having long struggled with poverty, he was first appointed inspector of the military hospital at Leipsic, and afterwards professor of botany. The publication of his great work on Mosses was begun in 1787, and during the succeeding ten years was completed in four vols. folio, and illustrated with coloured plates. He died in 1799.

HEDYOTIS, a genus of plants belonging to the Tetrandria class.

HEDYSARUM, French Honeysuckle, a genus of plants belonging to the Diadelphia class; and of which the species *hedysarum gyrans*, a native of Bengal, is remarkable for the constant motion of its leaves, even without the slightest agitation of the air.

HEGIRA, or Hejera, derived from an Arabic word signifying flight, is an epoch among the Arabs and Mahometans, to which they refer historical events, and commences on the night between the 15th and 16th of July 622 of the Christian era, when Mahomet fled from Mecca. The year of the Christian era which corresponds with any year of the Hegira, is found by multiplying by 354, dividing by 365, and adding 622. Thus the year of the Hegira 1236 multiplied by 354, divided by 365, and 622 being added to the quotient, gives 1820.

HEIDELBERG, a city of the circle of the Lower Rhine in Germany, is situated on the south side of the river Neckar, which is crossed by an excellent bridge; and is long and narrow, and surrounded by walls having six gates. It is the seat of a university founded in 1386, and it contains three churches, an economical society, a military hospital, an anatomical theatre, and other institutions, and above 20 fountains; and, as objects of curiosity, may be noticed the statues of the ancient electors on the front of the castle, which is now in ruins.

The population is about 12,000. Heidelberg has been long known for the manufacture of wines, and the other manufactures are clothing, paper-hangings, soap, and wax-lights. The famous tun contains nearly 600 hogsheads. of wine.

HEILBROUN or Hailbron, a town of Suabia, in Germany is finely situated on the banks of the Neckar, is well built and fortified, and contains a church, which is remarkable for a peculiar Gothic tower, a public library, and a fine promenade. The population is 8000, and the inhabitants are employed in the distillation of brandy, paper and tobacco manufactories, and in tanning.

HEINECCIUS, John Gotlieb, a learned German civilian and elegant writer on jurisprudence, was a native of the principality of Altenburg, and was born in 1681, studied theology at the university of Leipsic, and assisted his brother at Goslar and Halle in the discharge of his clerical duties. At the latter place he was appointed professor of philosophy, and in 1720 was advanced to the office of public professor of law. He held a similar professorship for some time at Franeker, was afterwards removed to Frankfort on the Oder, to be professor of moral philosophy and logic, and finally returned to Halle, where he died in 1741.

Heineccius was greatly distinguished for his erudition and industry, as well as for the possession of the happy talent of embellishing the dry uniformity of jurisprudence with the flowers of polite literature. He was the author of numerous works on jurisprudence, all of which are written in Latin. His "Elements of the Institutions of Civil Law and of the Pandects," have been long in use as text-books in this country; and his "Elements of the Law of Nature and Nations," has been translated into English.

HEINSIUS, Daniel, an eminent scholar and learned critic, was born at Ghent in 1582. On account of the civil dissensions which at that time disturbed the low countries, his father retired with his family to England, afterwards to Holland, where he settled at the Hague, and then removed to Zealand, where the son prosecuted the study of the languages and philosophy. At the early age of ten he composed a Latin elegy, and about the same time produced several epigrams; at 14 he was sent to study law at Franeker, but his inclination and industry were more directed to Greek literature; and when he was removed to Leyden he continued the same course of study under the patronage of the celebrated Joseph Scaliger. In his 20th year he read public lectures at Leyden on the Latin and Greek authors; was afterwards appointed professor of politics and history; and the distinguished reputation which he soon acquired produced for him honorary titles from different states. He died at Leyden in 1655.

The illustrative notes and commentaries of Daniel Heinsius on Silius Italicus and the New Testament, afford sufficient evidence of his learning and critical skill; he was the editor of Horace, Seneca's tragedies, Hesiod, Theocritus, and other classical authors; and his Latin poems, consisting of elegies, miscellanies, and two tragedies, place him in the foremost rank among modern authors in that language. He was also the author of some Greek poems.

HEINSIUS, Nicholas, the son of Daniel Heinsius, was born at Leyden in 1620, and as a poet and a critic was not less eminent than his father. Educated under the auspices of his father, he pursued with great zeal and success the same line of study; and for the purpose of collecting information he visited England, France, Germany, and Flanders, and resided for several years in Italy, where he published his Latin elegies under the title of *Italics.* The favourable opinion which Christina, the celebrated queen of Sweden, had expressed of his poems, induced him to visit that country in 1649; and having undertaken a journey through France and Italy, for the purpose of purchasing manuscripts and medals to enrich the library and cabinet of that princess, he returned to Sweden in 1653. But the abdication of the queen involved him in pecuniary difficulties on account of the money he had advanced for her. The appointment of resident at the court of Sweden from the United States, relieved him from this embarrassment. At his father's death he returned to Holland, and was appointed secretary to the city of Amsterdam; after which he was again nominated resident at the court of Sweden, and in 1669 envoy-extraordinary to Muscovy. He then retired from public affairs, first to Utrecht, and then to Vienna, where he spent the remainder of his days in literary leisure. He died at the Hague in 1681.

Besides his Latin poems, Nicholas Heinsius was the editor of Claudian, Ovid, Prudentius, and Velleius Paterculus, with illustrative notes; and after his death his notes on several other Latin classics were published.

HEIR, a person who succeeds another by descent to lands or tenements. Heir-apparent is a person who is so denominated in the lifetime of his ancestor, and at whose death no change of circumstances can prevent him from being heir-at-law, as the eldest son of a family; and heir-presumptive is one who, if the ancestor should die immediately, would be the heir, but whose right of inheritance may be defeated by some contingency, as, in the case of a brother being heir-presumptive, he is excluded from the inheritance by the marriage of his predecessor and the birth of a son.

HEIR-LOOM, formed of heir and the Saxon word loom, which signifies limb or member, is a law term, denoting such goods and personal effects as necessarily fall to the heir along with the heritable property, as pictures, silver plate, and sometimes different kinds of furniture. The ancient jewels of the crown are held to be heir-looms, and are therefore not devisable by will.

HEISTER, Lawrence, an eminent anatomist and surgeon, was born in 1683 at Frankfort on the Mayne, received his medical education at Amsterdam, served as surgeon and physician in the Dutch army, and in 1710 was appointed professor of anatomy and surgery at Altdorf, where he acquired great celebrity by his lectures and writings. Ten years afterwards he removed to Helmstadt, and in that university spent the remainder of his days. He died in 1758. He is the author of numerous works connected with medicine and surgery, and his "Compend of Anatomy," and "Institutions of Surgery," were long regarded as standard books.

HELENA, St. an island situated in the southern part of the Atlantic ocean, in south latitude 15° 55′, and west longitude 5° 49′; is about 28 miles in circumference, and contains an area of 30,000 acres.

Aspect.—This remarkable island presents a rugged but striking appearance, and is rendered almost impregnable. The strata are disposed in the most varied directions, and precipices, which are elevated to an immence height, overhang the ocean with imposing grandeur, while the central eminences are well wooded and form an agreeable contrast. The sea round the coast is unfathomable; the tide rises occasionally to the height of five feet; and owing to the dreadful surf the landing was extremely dangerous, till, in 1790, a proper wharf was constructed. The only anchorage is in Chapel-valley bay, on the leeward side of the island; and the principal inlets, all of which are well fortified, are by James's town, Rupert's bay, and Lemon valley on the north west, and Sandy bay on the south east side. The fortifications contain about 500 pieces of cannon.

The island is unequally divided by a chain of lofty hills, from which ridges and vallies branch off in different directions. Diana's peak, which forms the eastern termination of the chain, is 2700 feet above the level of the sea, and on the same ridge Cuckold's point rises 2672, and Halley's mount 2467 feet. Near the sea, Flag-staff, so called from a flag-staff being placed on the summit, rises 2272 feet, and Barnscliff 2015 feet; and to the southward of Ladder-hill, High-knoll is 1903 feet. The alarm-house, in the centre of the island, is 1960 feet; and Longwood house is 1762 feet above the level of the sea.

In the north-west side of the island, in James's valley, which is of a triangular form, and about a mile and a half in length, is situated James's town. It is strongly fortified, and consists of one principal street, which divides into two others, and contains a handsome parade, and a number of gardens, groves, and walks in the vicinity. The houses are built two stories high, and in the English fashion. The castle or government house, on one side of the street, is enclosed with a wall, and the church is on the opposite side. The barracks, an hospital, and a new garden, are situated in the upper part of the valley, and excellent roads have been formed by blowing up the rocks. About three miles from James's town is Plantation-house the delightful country residence of the governor; and Longwood, also about three miles from the town, contains an area of 1500 acres, and is now the residence of the ex-emperor of France.

Climate.—The climate of St Helena is peculiarly healthful, and the soil is productive. The south-east wind prevails, and moderates the heat in the vallies; the rains are pretty regular, and most plentiful in February; but on Diana's peak, where the trees are thought to attract the clouds, the rains are frequent. The atmosphere is generally clear, and thunder and lightning are rare. Numerous rills flow from the heights and fertilize the country.

Natural history.—The rocks of St Helena are of a basaltic nature; limestone is abundant; traces of gold and copper have been also observed, with some indications of iron ore; and a substance called *terra puzzolana*, is much employed as a cement, though mud is used for ordinary buildings.

The vegetable productions are plentiful; various trees, among which are ebony, the cabbage tree, the oak, cypress, and pinaster, thrive well. The orchards are productive, and the vine, limes, figs, oranges, lemons, citrons, and a great variety of other fruits, are plentifully produced in the vallies; but the attempts to raise wheat, oats, and barley have not been successful. The rearing of live-stock, which is promoted by the abundant pasturage, is much attended to; but the stock of cattle and sheep is small, owing to the great demands of homeward-bound ships from India. Goats and rabbits are abundant, and the island is very much infested with rats and mice. A great variety of fish is obtained on the coast, among which are the coal-fish and the flying fish; turtle are obtained in the months of December and March, and whales are sometimes taken in the roads. Of the feathered tribes, pheasants and patridges are numerous, sea-fowl are abundant, and their eggs, deposited in the cliffs, are gathered in October and November. The canary bird and red linnet are common, and the Java sparrow is a troublesome inmate to the farmers.

Government, &c.—The island of St Helena is held from the British crown by the East India Company, and a governor and council have the management of affairs. The civil establishment consists of an accountant, pay-master, store-keeper, secretary, and others; and the military consists of a corps of artillery, a regiment of infantry, and five companies of white and black militia,—but every man in the island is trained to the use of arms. The annual expense of the establishment has been rated at L.40,000, with an addition of L.10,000 for contingencies; but Bonaparte's residence in the island is said to have raised the expense to L.300,000.

The revenue to the company arises from the rents of lands, which are improving, and amount to about L.1100, and the profits of a monopoly of arrack, which are about L.6000, and they have a sunk capital of L.200,000 in public works and stores. But the accommodation for the company's shipping is of itself a great advantage.

Population.—The island is divided into three districts, the East, West, and South, which form only one parish, with two churches; and the population, in 1814, including the garrison, amounted to 4000. The labour of cultivating the country chiefly belongs to the blacks, who are now in comfortable circumstances, and many of whom are free. The inhabitants are said to be in their manners kind and agreeable. Their principal subsistence during great part of the year is rice and salt provisions; and, owing to the spirit of monopoly, the necessaries of life become enormously expensive, particularly to strangers, none of whom, it may be observed, can settle in the island without permission from the East India Company.

A journey from one side of the island to the other is considered by the planters a most serious matter, and many of them never travel so far. St Helena forms so small a speck in the Atlantic ocean that navigators are led assiduously to keep the exact direction, and to take advantage of the south-east trade-wind. At a very considerable distance the St Helena pigeon indicates the approach to land; and over all the island signals intimate the approach of vessels to any quarter.

History.—The Portuguese, in 1501, were the first discoverers of St Helena, at which time it was almost entirely covered with trees; and seals, sea-lions, sea-fowls, and turtle, were the only inhabitants. Fernandez Lopez, a Portuguese nobleman, becoming a voluntary exile on the island, great contributions were made for his comfort; and after a residence of four years, in which period the fruits, trees, and live-stock had remarkably increased, the government became sensible of its importance, and made desirous of retaining it. But, in 1588, St Helena was visited by captain Cavendish; and the Dutch and Spaniards soon obtained a knowledge of it. The Dutch became possessors, but abandoned it in 1651, when the English East India company formed a settlement, obtained slaves from Madagascar, by the offer of land induced individuals from England to become settlers, and, after ten years, obtained a charter of possession from Charles II. In 1665, the Dutch obtained possession for a few months. The ruinous consequences of the fire of London, in 1666, led many families to emigrate to the new settlement. In 1672, the Dutch again retook the island, but were soon expelled. In 1665, a fortification and batteries had been erected, but above a century elapsed before the heights became fortified. The history of the island, till the beginning of the 18th century, consists but of petty contentions and profligacies. But between 1708 and 1714, great improvements were set on foot in reforming the morals and habits of the people, improving and cultivating the lands, working the lime-quarries, and manufacturing bricks and tiles; and a code of laws was published. Between 1727 and 1731 the island was well planted with furze for fuel, and attention was paid to the increase of trees; Scotch firs and acorns were introduced in 1749, and also the coffee plant, which thrives well. The increasing trade of the East India company added to the importance of St Helena; and in 1759 new improvements were made in the establishment. A mutiny took place in 1783, but was suppressed. The military were rapidly improved under governor Brooke; and, between 1788 and 1800, upwards of 12,000 soldiers were qualified and sent to India. The same governor, to whom the island is much indebted for judicious improvements, established a code of signals, built a convenient wharf, promoted the comfort of the slaves, encouraged planting and agriculture, and rendered St Helena very serviceable to Great Britain; and under colonel Patton and governor Beatson very considerable improvements have been suggested or adopted.

HELENIUM, Bastard Sun-Flower, a genus of plants belonging to the Syngenesia class.

HELIANTHUS, Great Sun-Flower, a genus of plants belonging to the Syngenesia class, of which *helianthus annuus* constitutes a splendid ornament of the shrubbery.

HELICON, a celebrated mountain of Bœotia, sacred to Apollo and the Muses; and hence Heliconides is a poetical appellation of the muses. The Grove of the Muses adorned with their images, and with statues of Apollo and Bacchus, Linus, and Orpheus, the fountain Aganippe, and, at the distance of 2½ miles in a higher region of the mountain, the fabled fountain Hippocrene, supposed to have been struck out by the hoof of Pegasus, are particularly described by Wheler, and by a later traveller Dr Clarke. The modern name of Helicon is Sagara, which it is conjectured is derived from Ascra, an ancient town situated on the mountain, and memorable as the birth-place of the poet Hesiod.

HELICONIA, Base or Wild Plantain, a genus of plants belonging to the Pentandria class.

HELICTERES, Screw Tree, a genus of plants belonging to the Gynandria class.

HELIGOLAND, or Helgoland, is a small groupe of islands in the North sea, belonging to Great Britain, distant from the mouths of the Elbe and Weser about 36 miles, and consisting of the island of Heligoland, Sandy island, and several reefs of rocks, the principal of which is called the Monk. Heligoland has at different periods undergone great physical changes. Sandy island was at one time connected with the low ground of the island of Heligoland; part of the reefs were covered with earth; and before 1720 a narrow isthmus between the two islands was rarely covered with water; but the Waal, a strait which now separates these islands, is 18 or 20 feet deep.

The island of Heligoland consists of the high land and the low land, forming a circumference of nearly three miles, and is said to have been reduced by the inroads of the sea from 11 miles in length to one mile, its present extent. The greatest height of the high land is 166 feet, and the low land, which is found to increase, is connected to the eastern part of the former by a rock nearly three miles long. The extent of Sandy island is about two-fifths of Heligoland. The rocky strata are composed of indurated clay, which alternates with a grey limestone, in which are distributed organic remains, and some indications of native copper and other ores of that metal. The soil produces oats and barley, and the high lands afford good pasturage for sheep and cattle.

The population exceeds 2000, and fishing and piloting vessels up the Elbe and Weser, and contiguous ports, are the chief occupations of the inhabitants. Heligoland was taken from the Danes in 1807 by a British squadron, and being a place extremely convenient for trade, especially during war, has been retained as a British possession.

HELIOCARPUS, Sun-seed, a genus of plants belonging to the Dodecandria class.

HELIOMETER, derived from the Greek, and signifying to measure the sun, is an instrument invented by the French astronomer Bouguer, for ascertaining the diameter of the heavenly bodies, and particularly that of the sun and moon, and is described in the Memoirs of the Academy for 1748.

HELIOPHILA, a genus of plants belonging to the Tetradynamia class.

HELIOPOLIS, signifying the city of the sun, was an ancient city of Egypt, was erected on an artificial mound of earth, that it might be beyond the reach of the waters of the Nile in the time of the inundations, and was famous on account of the temple of the sun, as well as on account of its celebrity as a seat of learning, to which the philosophers of all countries were attracted to be initiated in the sciences and mysteries of Egypt. Heliopolis is the city of On of Moses; and the pillar of On, more than 60 feet in height, and consisting of a single piece of Egyptian granite, is the only remain of antiquity that now indicates the place of the city.

HELIOSTATA, or Heliostate, an instrument invented by s'Gravesande for the purpose of fixing as it were the rays of the sun in the same position during the motion of the earth. This object is obtained by means of clock-work, which communicates to a polished mirror a steady motion, so that the rays of the sun admitted into a dark room are retained in the same position as long as it is requisite to continue the experiment.

HELIOTROPE, or Blood-stone, a mineral substance belonging to the siliceous genus. See Geology.

HELIOTROPIUM, Turnsole, a genus of plants belonging to the Pentandria class, and of which *Heliotropium Peruvianum* is a frequent inmate of the green-house and parlour, on account of the agreeable fragrance of its flowers.

HELIX, the Snail, a genus of shell-fish belonging to the class of *Vermes*. See Conchology.

HELLEBORUS, Hellebore, a genus of plants belonging to the Polyandria class.

HELLESPONT, a narrow strait between Asia and Europe, near the Propontis, which is said to have received its name from Helle, who was drowned in it in a voyage to Colchis. Leander, in attempting to swim across to his lover Hero, lost his life in this channel; and Xerxes, when he invaded Greece, constructed a bridge of boats for the purpose of transporting his army over it. The breadth is about a mile and a half, and in the narrowest place half a mile. It is now called the Dardanelles.

HELLOT, John, a French chemist of considerable reputation, was born in 1686, and was destined to the clerical profession; but the perusal of a book on chemistry led him to prosecute the study of that science. After being many years editor of the Gazette de France, he published in 1750, under the auspices of government, a translation of Schluter's Treatise on the "Fusion of Ores and on Founderies," in two volumes 4to; and in the same year appeared his best work, "The Art of Dyeing Wool and Woollen Stuffs," which is the first in which chemical principles are applied to that art, and is still referred to. He was also the author of various papers in the Memoirs of the Academy of Sciences; and he died in 1766.

HELMINTHOLOGY.

INTRODUCTION.

Utility, &c.

Definition.—Under this term, which, in the Greek language, signifies a *discourse on worms*, has been generally comprehended a particular department of zoology, teaching the natural history of those tribes of animals which Linnæus included in his sixth class, VERMES. Although the term *worms*, as applied to a great variety of animals materially differing from each other in appearance, structure, and functions, be confessedly incorrect, the name of this department has so long been received and understood, that it may still be adopted with propriety when the animals of which it treats are accurately defined and described, and their differences clearly pointed out.

In the present treatise, it is intended to explain the classification and illustrate the history of all those *invertebral, cold-blooded* animals, which have not been already mentioned under ENTOMOLOGY, or occasionally described under CONCHOLOGY, and which constitute the second subdivision of invertebral animals laid down in the introduction to ANATOMY.

Extent and utility.—The number and variety of animals which come under consideration in this treatise are considerable, as it will comprehend almost all those marine animals, or animal productions, which do not properly rank under the denomination of *fishes*, besides many species that creep on the earth, reside in lakes, ponds, and ditches, take up their abode within the bodies of other animals, or lurk unseen in various liquors, till compelled by the microscope to emerge from their obscurity, and pass in review before the "experienced eye" of science. Many marine animals which are supposed to resemble terrestrial objects, and from their different abodes are distinguished by the epithet *sea*, as the sea-hare, sea-mouse, sea-urchin or sea-egg, sea-pen, sea-anemone, sea-marigold, sea-nettle, sea-star,—the cuttle fish,—the proper worms, whether marine, terrestrial, or intestinal,—the medicinal leech,—the animalcules called microscopic,—the polypes, which propagate by slips and cuttings,—may serve as examples of the extent and variety to be expected in this department. Here are to be found objects which appear to form connecting links between the several kingdoms of nature; moving creatures which, in their expanded state and glowing in all their native colours, bear a striking resemblance to flowers, and have accordingly been called *animal-flowers*; and others of a stony hardness, which, from their numerous arborescent ramifications, seem petrified shrubs despoiled of leaves, and bearing, by way of blossoms, numberless minute animals of a radiated form.

The animals which inhabit the numerous tribes and species of shells have been sufficiently described under CONCHOLOGY; and the utility of that part of Helminthology, as indicating several delicious or convenient articles of food, and other objects employed as elegancies of dress, or in the ornamental arts of life, has there been pointed out. The species to be here particularized are also interesting in many points of view. Some of them, as the *cuttle-fish* and the *sponge*, are of use in various arts; others, as *coral*, are formed into various trinkets; and all of them are objects of interest, as they enlarge our ideas of the infinitude and variety of nature's works, exhibiting almost, if not precisely, the extremes of enormous bulk and inscrutable minuteness, and displaying a wonderful gradation of structure and function, from the simplest animated atom merely perceptible to the eye, and shewing no mark of activity but motion, to the gigantic *octopus*, whose body is sometimes more than 12 feet across, with arms 40 or 50 feet long, and which possesses an organization nearly as complex as that of the vertebral animals, and exercises functions superior to many of them.

History.

A diligent attention to one order of these animals, the proper zoophytes, has enabled geologists to explain an important circumstance in the structure of this globe. It was long known that very high mountains sometimes shewed abundant remains of organized beings, and that in some places whole banks and hills are nearly one immense mass of shells. But the observations of Cook and other navigators have shewn that the extensive rocky reefs, so dangerous to ships, are the production of myriads of minute polypes; and that, by the gradual but unceasing labours of these diminutive builders, banks of such elevation and extent of surface have been formed, as to afford rational ground for supposing that many of the islands of the Pacific ocean had a similar origin.

HISTORY.

Helminthology has, till the present century, been less cultivated than any other department of zoology. Very few of its objects were known to the ancients; and their history of such as they were acquainted with, is more fabulous and more ridiculous than is usually seen in the marvellous narrations of the fathers of natural history. These remarks apply more particularly to Aristotle, Pliny, and Ælian, who mention polype of such size and strength that they can draw a ship below water, and swallow the men.

These fabulous relations were repeated in the 16th century by Conrad Gesner and Rondelet, in their writings on aquatic animals, and in the 17th century by Aldrovandi and Johnston. The former of these last writers, in particular, describes a polypus whose strength and fierceness equal those of the lion, and which, so far from avoiding a contest with a body of men, will wait the attack, and vigourously strive for victory.

The establishment of the Royal society of London in 1662, by which the attention of British Literati was particularly turned to natural history as well as science, forms an important era in the history of helminthology. The members soon began to furnish observations on worms and small aquatic animals, which the microscope, then lately invented, enabled them to examine; and in the 13th volume appeared several papers on animalcules. Such communications continued to be made till the 59th volume in 1769. Between the 42d and the 67th volumes, some curious particulars relating to the *actiniæ*, or animal-flowers, were communicated. Exclusive of these papers, little information respecting the present subject is to be found in the Philosophical Transactions; as not more than 109 species, including 60 testaceous animals, are there described.

Among the members of the Royal society by whom helminthology was advanced, though not materially improved, were John Ray and Sir Hans Sloane, the former in his Methodical Synopsis of Fishes, and History of Insects, and the latter in his Natural History of Jamaica.

During the eighteenth century helminthology became a rational and scientific part of zoology, and first acquired a methodical arrangement. Linnæus, in his System of Nature, arranged the *Vermes* in a sixth class of animals, which he subdivided into five orders: *Intestina*, simple articulated animals, which, for the most part, live within other animals; *Mollusca*, animals without shells, and of a soft consistence, furnished with tentacula or arms, and generally inhabitants of the sea; *Testacea*, the proper shell fish, differing from the former chiefly in being covered with calcareous shells; *Zoophyta*, animals resembling plants, fixed by a root, and shooting up into a stem, but possessing the faculty of motion; and *Infusoria*, the animalcules found in most watery liquors, especially in vegetable infusions. The number of tribes and species distinguished by Linnæus was very small, and he was confessedly very imperfect in this part of his system. Gmelin, in his 13th edition of the System of Nature augmented the number of species, and improved the characters, by introducing the observations and discoveries of later naturalists, but preserved the same arrangement, which was also adopted by Bruguiere in his treatise of Helminthology which forms part of the Encyclopedie Methodique.

In the meantime experiments and observations were made and recorded by Leuwenhoeck, *Arcana Naturæ*; Needham, *New Microscopical Observations;* Otho Frederick Muller in his work on *Infusorian Animals*, and his *Zoologica Danica*; Bonnet, in the fifth volume of his works; Trembley, *Memoires pour servir a l'Histoire des Polypes*; Ellis and Solander, in their work on Corallines; Baker *on Microscopes, and the discoveries made thereby*; and Pallas, *Elenchus Zoophytorum*. Similar observations have also been made by Spallanzani, *Tracts on the nature of Animals and Vegetables, &c.*; and an interesting account of animal-flowers was given by Hughes in his *Natural History of Barbadoes*.

Since the commencement of the 19th century, still further improvements have been made in the systematic arrangement of helminthology, especially by Cuvier, Dumeril, Savigny, and Lamarck. At the conclusion of the preceding century M. George Cuvier had published his arrangement of the Linnæan vermes in his *Tableau Elementaire de l' Histoire Naturelle des Animaux*; and the same arrangement, in a tabular form, was soon after given in his Lectures on Comparative Anatomy, published under the care of Dumeril and Duverney. In the meantime many valuable papers by the same naturalist appeared in successive numbers of the *Annales du Museum d' Histoire Naturelle*, on the structure and history of the Mollusca; and they have since been collected into one volume, under the title of *Memoires pour servir a l'Histoire des Mollusques*. The latest modification of this arrangement is contained in the second and fourth volumes of Cuvier's *Regne Animal*. As the classification given in the present treatise is in a great measure founded on the arrangement of Cuvier, retaining as far as possible the genera of Linnæus, it will be proper here to offer a short exposition of the former.

Cuvier arranges the Linnæan Vermes under three great divisions or classes, MOLLUSCA, ANNELIDES, and ZOOPHYTES. The first are subdivided into six subclasses; *cephalopoda*, or those which have tentacula about the head, including the sepiæ, nautili, and several fossil remains; *pteropoda*, or such as have the mouth garnished with fins instead of feet, including the clios, hyaleæ, and some other genera; *gasteropoda*, or those which move on the belly, comprehending among others the dorides, tethydes, aplysiæ, slugs, snails, and a great variety of shell-fish; *acephala*, or headless mollusca, containing most of the other shell-fish, and several genera without shells, particularly the biphores or salpæ, and ascidiæ; *brachiopoda*, or such as have two ciliated arms twisted spirally, including the terebratulæ, lingulæ, and orbiculæ; and *cirrhipoda*, having a number of jointed feelers arranged in pairs, containing the barnacles and balani. The second class, ANNELIDES, is subdivided into *tubicola*, or such as construct a defensive tube of agglutinated sand or broken shells, including the serpulæ, sabellæ, terebellæ, amphitrites, dentalia, and some others; *dorsibranchia*, or such as have the respiratory organs regularly disposed along the body, including the nerides, aphroditae, amphinomes, and arenicolæ; and *abranchia*, or such as have no apparent respiratory organs, as the lumbrici and leeches. The ZOOPHYTES form five subdivisions; *echinodermata*, covered with a calcareous or leathery coat, and having the intestines floating loosely within, including the echini, star-fish, holothuriæ and sipunculi; *intestina*, or parasitical worms, comprehending the filariæ, tricocephali, cucullani, ascarides, strongyli, echinorynchi, hamulariæ, fasciolæ, tæniæ, and some others; *acalephæ*, or fleshy radiated sea animals, including the actiniæ, medusæ, and some others; *polypes*, or simple radiated water animals, either free or attached to a stem, including among others the numerous corals, corallines, madrepores, millepores, and sponges; and *infusoria*, or microscopic animalcules.

A similar arrangement was adopted by Dumeril in his *Traite Elèmentaire d' Histoire Naturelle*, and his *Zoologie Analytique*; but Lamarck has carried the new classification to a degree of minuteness and precision which, however desirable it may be for the purpose of acquiring an accurate knowledge of these animals, renders the study complex and difficult to ordinary readers. Lamarck has the merit of introducing the distribution of animals into *vertebral* and *invertebral*, now generally adopted, and in his numerous writings has contributed materially to improve this difficult department of zoology. His last and greatest work on this subject, not yet completed, is his *Histoire Naturelle des Animaux sans Vertebres*, in which he divides them into *apathic* and *sensitive*. Of the former he makes four classes, INFUSORIA, POLYPES, RADIATED ANIMALS, and WORMS, and of the latter six, among which are ANNELIDES, CIRRHIPEDES, and MOLLUSCA.

After all that has been done by these eminent naturalists for the improvement of helminthology, it is still the most imperfect department of zoology. Of many species, little more than the names are known, and the situation of several genera in the system is by no means clearly fixed. In no part of natural history is the synonymy more incomplete. Indeed, the obstacles opposed to the progress of this science must long retard its improvement. Nature herself throws impediments in the way of the observer that are not easily removed; the size of many species is so diminutive, that even a good microscope reveals little more than their general figure, so that a minute dissection is impracticable; and the situation of most species is so deep and inaccessible that they are discovered only by accident, and probably many hundreds still lie unknown in the recesses of the ocean. To follow them to their haunts is in most cases difficult, in some dangerous. Some attack the naturalist in the woods and marshy plains, and sting him almost to madness. Others are said to seize on the enterprising diver with their gigantic arms, and bear him to their rocky dens, or effectually prevent his return to the light of day by suffocation. The changes which some kinds undergo, or the minute differences which have been observed in others, also render it a difficult task to distinguish and characterize the species. Hence it happens that the number of species has been multiplied to an unwarranted degree by the introduction of varieties, and by describing as new such as had been noticed before under different names. The very circumstance of modern naturalists continually changing the names of well known tribes and species to suit their new ideas of classification, is a material barrier to the improvement of science; for though such names may be more strictly appropriate, the old ones are better understood, and systematic nicety should not be carried so far as to augment the necessary difficulties of the student.

In arranging the animals to be mentioned in this treatise, a classification, founded on the Linnæan system, modified according to the improvements of Cuvier and Lamarck, is adopted. They are divided into four orders, MOLLUSCA, ANNELIDES, INTESTINA, and ZOOPHYTES; including, under the last, the *Infusoria* of Linnæus and Muller. In this way the animals are described according to the rank which they appear to hold in the scale of animal existence, beginning with such as are most complex in their structure and most perfect in their functions, and gradually descending to those tribes and species which display the utmost simplicity in both. The Mollusca, or molluscous animals, have the most perfect structure, and perform the greatest number of functions of all the invertebral animals; and some of them even display marks of instinct and conjugal affection. The Annelides, or articulated worms, are lower in the scale; they have less perfect moving organs, fewer organs of sensation, a less complicated circulation, and appear to possess nothing like instinct or passions. The Intestina, or intestinal worms, are still less complicated in their organization, and less perfect in their economy. They have a knotted nervous system, though they seem to possess no senses but taste and feeling, have circulating vessels, but no heart, and no evident breathing organs, and perform scarcely any functions but sucking in nutritive juices and reproducing their like. Lastly, the Zoophytes, though they have generally organs for motion, and always of digestion, or often rather *imbibition*, shew no marks of a nervous or circulating system, and propagate rather like plants than animals, by buds or cuttings.

ORDER I. *MOLLUSCA.* MOLLUSCOUS ANIMALS.

General structure and functions.—The mollusca form the most perfect division of the invertebral animals in their structure and functions, and are therefore properly placed at their head in the modern systems of zoology.

Motion.—Although they have no skeleton and no articulated members, their organs of motion are very distinct, and often very powerful. Many of them have *tentacula* or feelers that supply the place of arms and legs, and serve to seize their prey, to support them against the fury of the waves, or to assist in transporting them from place to place; others have a foot which answers these two latter purposes, and in some cases enables the animal to spin a silken substance by which it may more firmly attach itself to rocks or other large bodies; but some have only muscles that admit of their crawling or swimming, or of opening and closing the shells which cover them. Their motions consist of contractions and relaxations, by means of which they creep, swim, and lay hold of various objects; but as their members have not the support of solid articulated levers, they cannot leap or spring forward with rapidity. Most of them possess a high degree of muscular irritability, and retain it for a long time in those parts which have been separated from the body.

Sensation.—Their nervous system, though far less perfect than that of the vertebral animals, is very distinct. The principal or central part is a dilated medullary portion situated near the mouth and across the gullet, which it envelopes like a nervous collar, and several similar but smaller portions, or ganglions, are dispersed about the body. From them proceeds a considerable number of nervous filaments to the belly and to the organs of sense and motion. The organs of the external senses vary much in the different kinds of mollusca. Many have eyes; and in some they are nearly of the same structure with those of fishes, while, in others, they are extremely simple. A few of them have rudiments of hearing organs; but, though it be probable that they both smell and taste, no distinct organs subservient to these senses have been discovered. That they possess the sense of feeling cannot be doubted; and in such as are not covered with a close shell, the skin which invests their bodies, the tubercles that are often attached to it, and, above all, the tentacula, seem well adapted to this function.

Digestion is performed in the most perfect manner by all these animals; but the digestive organs vary considerably in the several tribes and species. All have a mouth; and in some kinds this cavity forms a complete masticating apparatus, furnished with a beak like that of a bird, or with teeth capable of penetrating the skin of animals, or even breaking hard shells; but sometimes it is only a contractile and dilatable chink, or merely an orifice, incapable of varying its dimensions. In many cases, too, there is but a single opening to the alimentary canal, serving the double purpose of receiving the aliment and giving vent to the excrementitious matter. The stomach is sometimes a simple tubular cavity; at others is complex. They have all a large liver; and most have salivary glands.

Circulation.—The circulation in these animals is always double; the blood passing separately through the respiratory organs before it circulates through the body. They have a heart composed of a fleshy ventricle, situated between the veins leading to the gills and the arteries of the body. Some kinds have this cavity single, while, in others, it is divided into two or more; a few have two ventricles, one for the respiratory organs and another for the system; and as these ventricles are not united into one body, but are often at some distance from each other, such mollusca may be said to have two or sometimes three hearts. The blood is white or bluish, and seems to contain proportionally less fibrine than in vertebral animals. Cuvier thinks that in these animals the veins perform the office of absorption.

The *respiration* of mollusca is different according as they are destined to inhabit the earth or the waters. In the former, there is a chink or orifice by which the air enters into a membranous and vascular cavity; in the latter, the same office is performed by a tube or syphon, which admits the water to the branchiæ, or these organs are situated near the surface below a fold of the skin.

Integuments.—Most of the naked mollusca, or such as are not furnished with shells, have a doubling of the skin, which assumes different appearances in the different tribes. In some it resembles a cloak or mantle, and is distinguished by these names; in others it forms a tube or bag investing the body; and in others it expands into fins. The skin secretes a mucous fluid, which, in certain cases, consolidates into a horny or calcareous substance.

In many of these animals there is a difference of sex; and the female produces eggs, which are sometimes hatched within the oviducts.

Of the six divisions under which Cuvier distributes his class of mollusca, only the first four, *cephalopoda*, *pteropoda*, *gasteropoda*, and *acephala*, can be noticed here.

SECT. I. *Cephalopodous Mollusca.*

The animals of this section have a distinct head, with two lateral perfect eyes, that are not supported on footstalks as in some of the crustaceous insects; and the mouth is furnished with a beak resembling that of a parrot. Around the head are several tentacula like arms, furnished with little cup-shaped superficial cavities that act as suckers in enabling the animal to fix itself to objects, by exhausting the air at the points of contact. The body is covered with a cloak, within which are the orifices of the breathing organs. In some, the body is naked; in others, it is contained within a shell. Only the former come under present consideration. The rest have been noticed in CONCHOLOGY, see Vol. II. p. 549. They are all inhabitants of the ocean.

GENUS I. *Sepia.* CUTTLE-FISH.

Character.—Body naked. Tentacula eight or ten, furnished with suckers.

The Linnæan genus *sepia* is subdivided by the French systematists into three, *sepia*, *loligo*, and *octopus.* All of them agree in having the body inclosed in a bag or sheath from which the head protrudes. The head is round, has on each side a large moveable eye, and at its top is situated the mouth, terminating in two horny mandibles exactly resembling the beak of a parrot. Just before what is called the neck is a sort of funnel which leads to a membranous bag, and seems the extremity of the intestines. There are three distinct fleshy ventricles or hearts; a muscular stomach, like the gizzard of fowls, with which is connected a short intestine; a large liver; and a peculiar glandular organ, which secretes a liquor as black as ink. The female produces eggs which are so linked together as sometimes to resemble a bunch of grapes.

SPEC. I. Sepia *Officinalis.* Common Cuttle-fish.—*Char.* Ten tentacula, two longer than the rest; with a thick, oval, laminated, calcareous body, concealed below the cloak; skin smooth. Pl. 97. Fig. 1.

In this species the cloak is folded on each side all along the body so as to form two longitudinal fins. The whole animal seldom exceeds a foot in length, and about half as broad as it is long. The body, exclusive of the fins, is of an oval flattened form; and the skin, though smooth, is marked with numerous dark points. The head is large and broad, and the eyes remarkable for their size and brilliancy during the life of the animal. Around the mouth are arranged eight equal tentacula, sharp at the tip, and beset along their sides with numerous suckers, and beyond them extend two others, terminating each in a broad sucker, but smooth and slender next the head. With these organs the animal is supposed to fix and steady itself as with two anchors. Within a doubling of the cloak next the back lies the curious substance called the *bone* of the cuttle-fish, but it is so loosely attached to the neighbouring parts as to be easily removed after death. It consists of numerous concentric plates, united by cross and perpendicular columns. When dried it becomes light and friable, and even in its recent state is hard and inflexible. It continues to increase in size during the life of the animal, which would lead to the conclusion that there must be some vascular connexion between it and the body, but such a connexion cannot easily be discovered. The organ which secretes the inky fluid already mentioned is, in this species, situated deep in the belly, at a distance from the liver.

The common cuttle-fish, like the rest of the genus, is an animal of prey, living on the smaller marine insects and shell-fish. It is even a voracious, though not a formidable creature. When in danger of being seized by some stronger inhabitant of the deep, it ejects a quantity of inky fluid, which, by discolouring the water in its neighbourhood, enables it to elude the approaches of its enemy. The male always accompanies the female, and is very solicitous for her safety, defending her when attacked, and facilitating her escape; but the female is said to be timorous, and to forsake her mate when he is wounded or in danger.

The flesh of this species is sometimes employed as food, and the bone is used for making moulds for jewellers, in polishing, and in the composition of *pounce* for smoothing parchment, or thick paper, from which writing has been erased. The inky fluid is supposed to form the basis of Indian or Chinese ink.

Sp. 2. Sep. *Loligo*. The Calmar.—*Char.* Ten tentacula; two of them longer than the rest; a thin flexible cartilaginous body concealed below the cloak; fins forming two angular or circular expansions at the posterior or sacral extremity.

The calmars, of which modern naturalists describe ten or eleven varieties, including the *S. loligo*, *S. media*, and *S. sepiola* of Linnæus, differ from the common cuttle-fish in two remarkable circumstances. The solid body within the cloak is thin and narrow, almost like a lancet, and in the recent state is semitransparent, and the foldings of the skin form at the farther end of the body two broad muscular membranes, generally of a triangular shape, which perform the office of fins. The body is longer and proportionally smaller than in the former species, and the long arms are longer, and generally bent backwards. The other tentacula have the suckers on one side; the neck is more distant, and the eyes more prominent. The intestinal canal is longer; and the eggs, instead of being disposed in a racemose form, are arranged in the figure of a circle around a common cord or ligament. Their reservoir of inky fluid is situated in a hollow of the liver.

The calmars are found in all our seas, and one species or variety, with a triangular caudal fin, is frequently cast on shore on the sandy coast of the firth of Forth. They are exceedingly prolific, so that one female will sometimes produce 80,000 eggs.

Sp. 3. Sep. *Octopus.* Eight-armed, or gigantic Cuttle-fish. (*Poulpe*, Cuvier.)—*Char.* Eight equal tentacula; cloak forming no lateral expansions or fins; a small conical hard body on each side of the back.

This species differs from the two preceding in more particulars than are expressed in the specific character. It grows to a much larger size; its body is rounder and more closely invested by the cloak; its eyes are proportionally small; its tentacula very long and large, and united at their base by a common membrane, constituting very formidable offensive weapons, with which the creature seizes its prey, and drags it to the bottom. The eyes can occasionally be covered with a doubling of the skin, and the reservoir of ink is closely connected with the liver; the arms are about six times the length of the body, and are furnished each with 120 suckers.

An elaborate account of the structure of this animal is given by Cuvier in his *Memoires sur les Mollusques, p. I.*

Either the present species, or one very nearly allied to it, is the largest of the invertebral animals, and has been regarded with terror and detestation by fishermen and sailors, as committing havoc among their fish, and more especially the crustacea, and as threatening destruction to the crews of boats and small vessels. By some respectable writers, who are not over fond of the marvellous, individuals of this species have been described which measured from six to 12 feet across the body, and had arms 40 or 50 feet long; and it is said they will throw these formidable weapons around a boat or canoe and drag it below the surface, unless the crew be provided with hatchets or cutlasses to extricate themselves. But this is nothing when compared with the accounts of more credulous naturalists, who speak of animals of this description so large that their head weighs 700 pounds, and with tentacula that a man cannot grasp with extended arms,—whose weight is so great as to bring a good large vessel on her beam-ends. M. Denys Montfort, the continuator of Buffon in this department of natural history, who wrote the first four volumes of the History of Mollusca in Sonnini's edition, has collected from the writings of Pliny, Elian, Aldrovandi, and others, the most surprising and marvellous stories of the enormous bulk and terrible achievements of what he calls the *colossal poulpe*; and he gives a print of a ship with one of these animals hanging at its gunwale, and twisting its arms about the masts and rigging. This author supposes the kraken, described by Eric Pontoppidan, the Norwegian bishop, as the largest animal in the creation, whose body rises above the surface of the waters like a mountain, and raises its arms like the masts of a ship, to be a species of octopus or *poulpe*. As these stories are generally held fabulous, though repeated by so many authors, it is unnecessary to do more than allude to them here. That such enormous animals may exist in the wide expanse of ocean it were arrogance to deny, as it would be presumptuous to set bounds to the power of the Creator; but as they have not been seen by later naturalists, and the numerous scientific navigators who have traversed these regions for a century past, we must suspend our judgment, or conclude that such accounts are the exaggerations of ignorance and superstition.

It is difficult to fix the exact number of species in the genus *sepia*. Gmelin, in the last edition of Linnæus's System of Nature enumerates only eight, but M. Montfort has described and figured seventeen.

SECT. II. *Pteropodous Mollusca.*

The animals of this division differ from the former in having no remarkable tentacula, but only fins placed like wings beside the mouth. Hence their only motion is swimming; and they can neither creep nor fix themselves to objects. Most have a distinct head, and very apparent eyes. In some the body is soft and naked; in others covered with a shell. Cuvier divides this section into two,—those with distinct heads, of which he reckons four genera, and those whose head is not distinct, constituting one genus. By way of illustration, it is sufficient to describe the following:

GENUS 2. *Clio.*

Char.—Body naked, free, and floating; head distinct, and furnished at each side with a fin. Gills at the surface of the fins.—*Cuvier.*

Gmelin characterized six species of clio; but later writers have reduced them to four. They agree in having an oblong body without an investing membrane; a head formed of two round lobes, from which proceed small tentacula, and furnished with two fleshy tips; a small tongue; and tubercles, which some regard as eyes. The stomach is broad, the liver voluminous, and the intestines short. They are inhabitants of the ocean, and serve as food to whales and large fishes.

SPEC. 1. *Clio Borealis.* Northern Clio.—*Char.* Body gelatinous and transparent; fins triangular; tail pointed. See Plate 97. Fig. 2.

It is an inch or two in length. The body is of a pale blue colour; but the head and tail are of a bright red. It is found in great abundance in the North Atlantic ocean, and forms a chief part of the food of the Greenland whale.

SECT. III. *Gasteropodous Mollusca.*

This third division comprehends the greater part of the mollusca both naked and testaceous, and forms one of the most natural and distinct sections in this part of zoology. They are generally furnished with a fleshy disk below the belly, on which they crawl; and the back is covered with a cloak, more or less extensive, and of various figures. The head is more or less evident in the fore part of the body according as it is less or more enveloped in the cloak; it is generally protruded above the mouth; with tentacula varying in number from two to six, and always on the upper part of the head. These organs seem subservient to the senses of feeling or smelling. The eyes, when present, are very small, and are sometimes placed in the head, sometimes at the base, the side, or the extremity of the tentacula. There is never more than one heart, which is situated between the pulmonary veins and the principal artery of the system. Many of them have the body entirely naked; some have a small concealed shell; but most of them are enveloped with a shelly covering, into which they can retreat at pleasure. Many have a difference of sex; but some are hermaphrodite.

The respiratory organs, or *branchiæ*, offer, in this division, several remarkable varieties, on which Cuvier has founded a subdivision of it into seven heads. In some the branchiæ are perfectly exposed, and are situated on some part of the back; in others they are partly hidden below the folds of the cloak; in others they are entirely concealed within the cloak; in some the air enters a cavity through an external opening, while in others that inhabit the water, the branchiæ are contained in a cavity opening without; and in others the branchiæ are situated within the cloak, near that organ called the foot. See Cuvier *Regne Animal*, Tom. II. p. 387. As the number of tribes and species to be here noticed is comparatively small, it will not be necessary to subdivide them.

GENUS 3. *Doris.*

Char.—Body oblong, flattened, entirely surrounded with a membrane extending to the top of the head; mouth below towards one extremity; vent on the lower part of the back, surrounded with branchiæ in the form of fringes.

In these animals the mouth forms a small trunk situated below the anterior margin of the cloak, and furnished with two small conical tentacula, while the two other tentacula, in the form of clubs, arise from the upper part of the cloak. The stomach is membranous; and there is a gland twined about the liver secreting a peculiar liquor, and opening by a hole near the vent. The species, which are about 15, are all inhabitants of the ocean, and, while they remain at rest in the water, the fringed branchiæ are expanded and make a beautiful appearance. When the animals are disturbed, and more especially when handled, they contract the branchiæ, and gradually withdraw them out of sight.

SP. I. Do. *Verrucosa.* Warty Doris.—*Char.* Body covered with large rounded prominent tubercles, interspersed with smaller ones in the intervals. See Plate 97. Fig. 3.

In this species, the upper tentacula cannot, as in some others, be withdrawn into cylindrical tubes, but are protected by two fleshy plates, veined on the inside. The branchiæ have the form of pinnated leaves, and are generally about fifteen in number, separated down to the base, and arranged round a circular disk, in the middle of which is a small tube that forms the vent. It has been found chiefly in the Indian ocean, especially about the isle of France.

For a minute account of the structure and appearances of the doris, see Cuvier's *Memoires sur les Mollusques.*

Many of the species of the Linnæan dores are now distributed under a new genus called *tritonia*, differing from the proper dores in having the branchiæ arranged in two rows on the back.

GENUS 4. *Scyllæa.*

Char.—Body oblong, nearly cylindrical, and terminating at one extremity by a broad tail, and at the other in a mouth furnished with tentacula that are not retractile; two pairs of digitated branchiæ along the sides.

The body is compressed and furnished with a foot that is straight, and grooved to enable the animal the better to attach itself to the sea weeds on which it is generally found. The mouth is like a small trunk, and has two pairs of tentacula. Along the back are two pairs of membranous crests, bearing on their inner edge the filaments that form the branchiæ. The middle of the stomach has a fleshy ring, armed within with cutting horny plates resembling knives.

Cuvier admits only one species, namely, Sc. *pelagica*, figured in Pl. 97. Fig. 4. which is found in all the known seas, attached to loose sea weeds.

The more showy animal called *scyllæa*, described by Bosc, and some other writers, is ranked by Cuvier as a distinct animal, under the name of *glaucus*.

GENUS 5. *Aplysia*. SEA HARE.

Char.—Body oval, oblong, convex; edged on each side with a broad membrane recurved over the back; head furnished with four tentacula, at the base of the upper of which are situated the eyes; branchiæ on the back, covered with an escutcheon containing a horny body.

In these animals the edges of the foot are straight, flexible, surrounding the back, and capable of being reflected on themselves; the head is supported by a long neck; the two upper tentacula are hollowed into a cavity like the ears of a quadruped, and the two others are flattened at the edge of the lower tip; the branchiæ on the back are in the form of very complicated leaves, attached to a broad membranous pedicle, and are entirely covered with the cloak; the horny body below the shield resembles a flat shell; the stomach is compound, partly muscular and partly membranous, and is furnished within with gristly bodies of a pyramidal form; the intestines are short; there is a particular gland which secrets a limpid liquor, said to be very acrid in some species, and from the borders of the cloak exudes a liquor of a deep purple colour, with which the animals render the water turbid to a considerable distance when they perceive the approach of an enemy. About six species have been described, all inhabitants of the sea, where they appear to live on sea-weeds.

SPEC. 1. Apl. *Depilans*. Common Sea Hare.—*Char.* Body wrinkled; of a livid colour, shaded with blackish-brown; posterior extremity obtuse.

It is this species respecting which so many marvellous stories have been related by different authors. There seems to be nothing extraordinary about the animal, except its singular appearance, which has given occasion to its common name; but it is said that the acrid liquor it secretes acts as a depilatory in taking off the hair from any part of the body which it touches, whence the trivial name. It is found in the Mediterranean. See Cuvier *Memoires sur les Mollusques*.

GENUS 6. *Limax*. SLUG.

Char.—Body oblong, fitted for crawling, having on the back a leathery shield, concealing a loose little shell; head furnished with four tentacula, capable of being wholly retracted, the two longer bearing each an eye at its extremity; certain openings on the right side of the neck.

Instead of a cloak the slugs have a fleshy jagged disk on the fore part of the body, but not covering the pulmonary cavity; in most species it contains a small oblong flat shell, or calcareous concretion. Not only the tentacula, but the head itself, can occasionally be drawn in so as to be out of sight. The mouth consists of a single jaw, in the form of a toothed crescent, with which the animals can gnaw with much voracity plants and fruits, on which they commonly subsist. The stomach is long, simple, and membranous.

About 15 species have been enumerated or described, and of them the following is best known.

SP. 1. Lim. *Agrestis*. Garden Slug.—*Char.* Body of a pale colour, with black horns.

It is this species which commits such havoc in the spring and summer in our fields and gardens; but it is found in most shrubby places. It not only devours large quantities of young green plants and fruits, but renders them disgusting and unhealthy, from the slime which is so abundantly secreted by its body. It is therefore held in just abhorrence by gardeners and farmers. It appears that this animal is capable of spinning a thread like that of a spider, by means of which it can readily descend from trees and other elevated objects.

SECT. IV. *Acephalous Mollusca.*

This division has received its name from the animals which it comprehends having no distinct head, but only a mouth, concealed at the bottom, or between the folds of the cloak. This membranous expansion is almost always doubled in two, and incloses the body like the covers of a book; but sometimes the two lobes are united before so as to form a tube, and in a few cases it is a close bag. In those animals which are not provided with shells, the cloak is sometimes membranous, sometimes cartilaginous. The brain is over the mouth, and the gills in the naked species are of a simple structure; the heart is generally single; the mouth is simple, and without teeth; the stomach is sometimes double, and surrounded by the liver; and the intestines are of various lengths in different species. There is no distinction of sex, and the young animals are produced in great numbers. All the species are aquatic.

Only two principal genera belong to the present treatise, the rest being almost all testaceous.

GEN. 7. *Biphora*. (SALPA, Gmel.)

Char.—Body free, oblong, appearing hollow, gelatinous, and enveloped in a cloak that is open at both ends.

The figure of the animal is regulated chiefly by the form of the cloak, which is either oval or cylindrical, and of a cartilaginous texture, having the anterior opening simply tubular, but the posterior closed with a valve; so that the water which flows through the cloak from behind, and impels the animal forward, cannot return in the contrary direction. The cloak is surrounded with muscular bands, the contraction of which assists the motions of the body. The branchiæ are in the form of a ribbon, and are placed across the middle of the tubular cavity of the cloak, attached by one extremity, so that the water in its passage through the cavity continually strikes against them. The heart, the liver, and other viscera are placed in a cluster near the mouth.

In the sunshine these animals display numerous brilliant colours, and their body is so transparent that their whole internal structure is easily seen. For some time after birth the young biphoræ are attached to each other like the links of a chain, and in this manner swim in concert. They are inhabitants of the ocean, and also found in the Mediterranean sea. About eight species are described by modern naturalists. The genus *dagysia* of Gmelin is now included among the biphoræ.

GENUS 8. *Ascidia.*

Char.—Cloak forming a close, oval, or cylindrical irregular sack, fixed at its base, containing the body of the animal, and terminated by two unequal openings, one of which is lower than the other.

The animals of this genus have a cartilaginous cloak, which is often very thick. The branchiæ form a large bag, at the bottom of which is the mouth, and near this opening lie the viscera. The cloak is enveloped in a loose membranous expansion.

These animals fix themselves to rocks and similar objects, and are entirely deprived of the power of locomotion. Indeed their principal sign of vitality consists in the alternate absorption and expulsion of the water, which enters by one of the openings of the cloak, and which, when disturbed, they throw out to a great distance. The species are numerous, and some of them have been used as food. They are all inhabitants of the ocean.

SPEC. 1. Asc. *Papillosa.* Papillary A.—*Char.* Body rough, with scarlet tubercles; openings of the cloak unequal and hairy. See Plate 97. Fig. 5.

This species is generally about three inches long and about two broad, of an oval form. Its upper part has two protuberances like nipples, the uppermost of which has a cruciform and the lower a triangular orifice, each surrounded with bristly hairs. The whole surface of the body is covered with numerous small scarlet knobs, of an oblong form. The extremity opposite to the openings is furnished with several irregular fringes or peduncles, by means of which the animal fixes itself so firmly that it cannot be torn away entire. The skin, which constitutes the greater part of the animal's bulk, is very thick and firm like the hide of a quadruped. It is found chiefly on the coasts of the gulf of Venice.

Besides the genera above-mentioned, Cuvier describes 21 others of the naked mollusca, namely, cleodora, cymbulea, limacina, hyalea, polycera, tritonia, thethys, glaucus, æolidia, tergipes, phyllidia, pleurobranche, dollabella, notarchus, acera, testacella, parmacella, onchidium, botryllus, pyrosoma, and polyclinum. A great many of the Linnæan mollusca are now distributed among the following orders, especially under the second and the fourth.

ORDER II. *ANNELIDES.* ARTICULATED WORMS.

General structure.—Under this order are ranked all those invertebral animals which have no proper articulated members like insects, though many of them have protuberances which perform the office of feet. They circulate red blood by means of a double system of vessels. Their motions are performed by means of numerous muscles attached to the rings or segments of which their bodies are composed; and some of them crawl on the earth by fixing one extremity of the body and drawing the other after it, or swim in the water by what is called a vermicular motion. In some these motions are assisted by short feet, by hairs or bristles which grow from the surface of the body, or by tentacula. Their nervous system resembles that of insects. Their digestive organs are various. They have properly no head distinct from their body; but there is always at one extremity a mouth, which is sometimes a simple orifice without jaws, sometimes is enlarged into a kind of disc, constituting the orifice of a sucker, by means of which the animal draws up the juices on which it feeds, and, in a few cases, the mouth is furnished with solid jaws or bodies that act as teeth. The intestinal canal proceeds almost in a direct line from the mouth to the vent, but generally has a slight contraction at each of the segments of the body, producing several folds within it. It has been already said that they have a double system of circulating vessels. Their respiratory organs vary in different tribes and species. Some have arborescent branchiæ attached to the extremity that forms the mouth; others have the branchiæ, of an arborescent or laminated form, placed in the middle of the body, or all along its sides; and a few have no apparent branchiæ, but respire through the skin or by some inferior cavity. The body is sometimes soft and naked; and in some cases the animals are inclosed within a calcareous or sandy tube or shell. All but one species are inhabitants of the waters; and most of them are marine.

Of the genera that inhabit tubes more or less solid, *Serpula* and *Dentalium* have been noticed under CONCHOLOGY. Of the others, the following are most interesting.

GENUS 1. *Amphitrite.*

Char.—Body inclosed within a tube composed of fragments of shells and sand; head furnished with numerous pointed feathered tentacula.

The amphitrites are in general very showy animals from having the mouth ornamented with horny plates like the teeth of a comb, which are often of a fine golden colour. These organs are supposed to serve as defensive weapons, and probably assist the animals in their progressive motion, or in collecting the particles of shells and sand with which they form their tubes. Another row of pectinated bodies is arranged on each side of the back next the mouth, which are probably the branchiæ or breathing organs. Their intestinal canal is very large, doubled into numerous folds, and is generally full of sand. Some of these animals cover their bodies with light tubes in the form of a regular cone, which they carry about with them. Others inhabit artificial tubes, which are fixed to different bodies, and the mouth of which is occasionally closed with the pectinated horny teeth, forming a crown around the mouth when the animal withdraws within the tube.

SPEC. 1. Amph. *Volutacornis.*—*Char.* Tentacula twisted; back furnished on one side with long fringed fibres, spirally twisted. See Plate 97. Fig. 6.

This species, which is one of the most beautiful of the tribe, has been lately discovered by Mr Montagu on the southern coast of Devonshire, and is described by him in the 11th volume of the Linnæan Transactions.

Lamarck ranks under this genus the *tubularia magnifica*, a beautiful animal found on the coast of Jamaica.

Genus 2. *Nereis.*

Char.—Body naked; mouth furnished with solid jaws, disposed in pairs, and with tentacula; rings of the body having projecting processes on each side. In this genus the body is very long, and the projecting processes or bristles are uniformly distributed along it. The head is furnished with numerous feelers; and the mouth has lateral horny jaws that are a little crooked. The animals bear some resemblance to the insects called scolopendræ or centipedes. They live in salt water, in holes among stones, or upon pieces of wood which lie at the bottom; and some of them inhabit horny or membranous tubes. They attack other marine animals. Some of the smaller species are supposed to assist in producing the phosphorescent appearance which is so often seen in sea-water, especially the following:

Spec. 1. Ner. *Noctiluca.* Shining Nereis.—*Char.* Body blue-green, with 23 segments; extremely small.

These minute animals, which are scarcely visible to the naked eye, are found in prodigious numbers in sea-water, and their wonderful agility renders their phosphorescent quality more remarkable. They are often found in innumerable multitudes lodging in the cavities of the scales of fishes, and are thought to produce that shining appearance which some fishes newly caught exhibit in the dark,—an appearance which is different from what takes place during the putrefaction of fish. A fish just caught out of the sea, when brought into a dark place, sometimes shows a glittering light which dazzles the eye, and on these occasions myriads of moving luminous points have been observed among the scales; but this appearance ceases when the shining moisture which covers the skin of the fish is dried up, so as to deprive the animals of their ordinary residence, and probably their usual nourishment.

Genus 3. *Aphrodita.*

Char.—Mouth without jaws, but furnished with distinct feelers; body flattened, with a membranaceous naked back, and very bristly sides; branchiæ short and covered.

The species of this genus are easily known by two longitudinal rows of broad membranous scales which cover the back, and under which are concealed the gills in the form of small fleshy crests. The body is generally flattened, and shorter and broader than in the other animals of this order. Within the body are observed a very thick and muscular gullet, capable of being thrust outwards like a trunk; and an irregular intestine, from the sides of which proceed a great number of branched tubes, whose extremities are fixed between the basis of bundles of bristles which serve the office of feet. All the species are inhabitants of the ocean; and the following is most worthy of notice:

Sp. 1. Aphr. *Aculeata.* Sea Mouse.—*Char.* Body oval, and covered on the back and sides with long bristly hair, reflecting brilliant colours.

Of all the annelides this species is the most remarkable for its curious external appearance and brilliant colours. The usual length is from six to eight inches, and it is two or three inches broad. Its belly is covered with a naked skin, rather prominent in the middle. The scales of the back are concealed with a quantity of hair resembling tow, which grows from the sides of the body, while from the same parts proceed groupes of strong spines partly piercing through the hair, and bundles of flexible bristles, having all the brilliancy of metallic lustre, and varying in almost all the colours of the rainbow. According to Cuvier, this animal does not yield in beauty of colour to the plumage of the humming-bird, or in lustre to the most brilliant precious stones, and, without doubt, when in its native element, it merits these eulogiums. Below the horny skin are about 40 tubercles, from which arise three rows of spines of different lengths; and each tubercle ends in a fleshy conical body. The animal is a native of the European seas, and is often cast ashore on our coasts. It is said to live on shell-fish.

Genus 4. *Amphinome.*

Char.—Mouth without jaws, but furnished with feelers; branchiæ long and feathery.

The present genus was formerly confounded with the preceding, and with the terebellæ; but is distinguished from both by having no scales on the back, and by each of the segments of the body bearing on each side a gill in the form of a plume of feathers, besides tendrils and bundles of bristles. The body, too, is generally longer than that of the aphroditæ. In other respects, especially as to internal structure, this and the former genus are similar.

Spec. 1. Amph. *Pilosa.* Hairy A.—*Char.* Body broad and depressed; a vertical crest, and two small feelers over the mouth. (*Terebella flava*, Gmel.)

This species is remarkable for its bundles of long bristles of a lemon colour, and for its beautiful purple gills. It is found in the Indian ocean.

Genus 5. *Arenicola.* Sea Bait.

Char.—Mouth without jaws or labial feelers; body round, with the extremities rounded and obtuse; anterior extremity broader than the other, having on each side tubercles terminating in bristles; branchiæ placed externally behind, tubercles in the middle of the body; the mouth is a fleshy trunk, more or less dilatable, and has neither teeth nor feelers; there are no eyes, and all the body except the posterior extremity has bundles of bristles proceeding from it. They are marine animals.

Spec. 1. Aren. *Tinctoria.* Common Sea Bait.—*Char.* Body of a yellowish ash colour, banded with blue; tail greenish; branchiæ of a fine red colour.

It is very common among the sand on the sea shores, from which it is dug by fishermen for baiting their nets. It is about a foot long, and has thirteen pairs of branchiæ. When touched it spouts out a great quantity of yellow liquor, which stains the hands of the same colour. This is the *lumbricus marinus* of Linnæus and Gmelin.

GENUS 6. *Lumbricus.* EARTH WORM.

Char.—No external branchiæ; body cylindrical, long, and naked, furnished with little spines; anterior extremity conical, posterior rather flattened and obtuse; segments of the body fleshy and contractile.

The generic character sufficiently describes the external form. Within are seen a straight wrinkled intestine, and some whitish glands towards the fore part of the body. The eggs descend between the intestine and the skin to near the extremity of the former, where they are hatched, and the young animals come out alive. There is a nervous cord, consisting of a great number of small ganglions placed close to each other.

SPEC. 1. Lumbricus *Terrestris.* Common Earth Worm, or Dew Worm.—*Char.* Body red, with eight rows of prickly bristles.

The appearance of the common earth worm is familiar to every one, and many of its habits are well known. It is generally seen in wet weather crawling on garden walks and beds, loosening the earth and throwing up little hillocks, by which it is supposed to do injury, by throwing out seeds and displacing the roots of young plants. Probably its chief mischief is that of rendering gravel walks unsightly, and adding to the labour of the gardener in rolling them smooth. On the other hand, it is of use in the economy of nature, by furnishing abundant food to several birds and quadrupeds, and probably does good by loosening and enriching the soil.

The earth worm has sometimes been confounded with the long round worm which infests the human body; but a little observation is sufficient to distinguish them. The principal differences will be pointed out after describing the latter under the next order.

GENUS 7. *Thalasema.*

Char.—No external branchiæ; body rounded, and furnished with bristles at the segments; posterior extremity much larger than the anterior, which resembles a conical funnel; two hooks below the neck.

The present genus has been formed by Cuvier, to include several of the Linnæan lumbrici, which differ from the last, not only in external appearance and some minute internal marks, but in being inhabitants of the waters. Their body is proportionally shorter, and the bristles are confined chiefly to the posterior extremity; their intestine is longer than the body, in consequence of making numerous folds.

GENUS 8. *Nais.*

Char.—No external branchiæ; body flattened, furnished on its sides with long bristles disposed in bundles. The body is long and naked, and the segments less distinctly marked than in the two preceding genera. In some species several black points about the head may be taken for eyes; the species live in holes among mud, at the bottom of the water, and are continually moving the fore part of their body, which they thrust out of these holes. They are small worms, found in great numbers in lakes, ponds, and ditches, and are remarkable for an astonishing reproductive power when cut or otherwise injured. Some of the larger species construct tubes of clay or rubbish in which they lurk.

GENUS 9. *Hirudo.* LEECH.

Char.—No external branchiæ; body oblong, more or less flattened, very contractile, and furnished with a sucker at each extremity; anterior extremity tapering almost to a point; skin rough.

The leeches have an oblong body transversely ridged; the mouth is at the smaller extremity, and formed into a lip, within which are three small jaws, or hard folds of the skin, by means of which they penetrate the skin of animals and suck their blood or juices, which form their principal nourishment, and which also serves as a sort of sucker by which the animals fix themselves, as well as, by the more conspicuous sucker at the other extremity, in moving from one place to another. On the lower part of the body are two rows of pores, forming the orifices of small internal pouches, of which the use is unknown. The intestinal canal is straight, but here and there expanded for about two-thirds of its length. The blood which they suck remains red, and without apparent alteration during several weeks. Some species are viviparous; and all the species are inhabitants of fresh water.

SPEC. 1. Hirudo *Medicinalis.* Medicinal Leech. *Char.* Olive-black, with six yellow ferruginous lines above, and yellow spots below. The medicinal leech, in its quiescent state, and of ordinary size, is from two to three inches in length. Numerous projecting rings are seen occupying the whole length of the body, especially when the animal contracts itself into small compass. Both head and tail are furnished with suckers, by means of which the leech attaches either extremity of its body with considerable firmness; probably first pressing flat the circular muscle which constitutes the sucker, and then raising the central part a little, so that a partial vacuum may be formed. The smaller extremity or mouth is furnished with three sharp teeth, by means of which it can penetrate not only the skin of man, but that of horses or oxen. With these teeth it makes a small triangular cut in the skin, and then sucks the blood till it be gorged, when it loosens its hold. When in the act of sucking, the rings of the neck are seen very distinctly contracting and dilating, so as to make the blood flow through the mouth where the air is exhausted into the stomach, which is composed of 24 small communicating cells. When the leech is allowed to retain the blood it has sucked, this fluid will remain in an uncoagulated state for a considerable length of time, according to some for several months, and is thought at last to pass off by transpiration through the skin, and to form the small delicate membranes which are frequently detached from its surface. But it seems more probable that these membranes and filaments are thrown off by the leech at different times, as the same circumstance takes place whether it be allowed to retain the blood it sucks or be forced to disgorge it. This animal is viviparous, and produces one at a time, about the middle of summer. It is found in clear lakes and running streams, and may be kept for many months in vessels partly filled with clean water, and occasionally changed when the water becomes impure. Those who have occasion for a considerable number of leeches may breed them, by placing those that are full sized and healthy in a stone or wooden reservoir, nearly filled with soft water, and having at one end a shelf, covered with moss or sods, and so placed that most of it may be fully exposed to the sun. The water should be changed once a-week in summer and once a month in winter, and is most conveniently drawn off by means of a cock, provided on the inside with a strainer to prevent the leeches from escaping. On adding fresh water it is recommended to put in first some that is muddy, which, it is said, makes the leeches thrive better. After the breeding season most of the full sized leeches should be removed into large open-mouthed vessels, and occasionally exposed to the sun. The young leeches require some years to arrive at full growth, and till then they may remain in the reservoir, which in cold weather should be surrounded with warm manure.

When leeches are to be applied for surgical purposes, the surface is washed perfectly clean, and smeared with a little fresh cream or blood. The leeches are for some time allowed to crawl about on a dry surface, as a piece of flannel, and then, being laid hold of with a piece of rag, the head is directed to the spot where it is wished that it should fasten. After it has fixed its head, if the body be gently prevented from being drawn upwards it frequently begins to bite, and may then be left to suck. Considerable art is often necessary when the leeches are languid to get them to fasten. After they come off, they are commonly forced to reject the blood they have sucked by sprinkling salt sometimes on the whole of their body. This often kills them or induces vesications on the skin; and a preferable method is to dip the tip of the finger in vinegar, and let fall a drop or two on the head, which is equally efficacious in *purging* the leech, as it is called, and far less injurious to its structure. Some recommend mechanically forcing out the blood by stripping the leech between the fingers, and perhaps, if properly executed, this may be the best method. After being freed from the blood, the leech is again put into clean water, and in general refuses to suck for some time, till it recover from the violence employed to purge it.

GENUS 10. *Gordius.* HAIR-WORM.

Char.—Body very long and slender like a thread, with slight transverse folds; neither branchiæ nor tentacula.

These animals are so small in their diameter that their structure cannot easily be investigated; and hence some naturalists deny them a place in the present order, and rank them among the proper worms or zoophytes. According to Cuvier they form the last link of the annelides, which they resemble in external surface and in the appearance of their nervous cord. They inhabit fresh waters, or live among mud or in ground that has been overflown, and are often seen in occasional puddles, roads, and unpaved streets.

SPEC. 1. Gor. *Aquaticus.* Common Hair-Worm.—*Char.* Body of a pale yellowish colour, with the two extremities black.

It is about the thickness of a horse's hair, and about ten or twelve inches long when full grown. Its skin is somewhat glossy. It is common in such fresh waters as have the bottom composed of soft clay, through which it passes as readily as a fish through water. Sometimes it moves with a tolerably quick undulating motion like a leech, while at other times its motions are slow and languid. When the water in which it lives is dried up, the worm soon loses all appearance of life. Its slender body shrivels, and it may be kept in this state for a considerable time. But when it is again immersed in water, it gradually attains its former dimensions, and swims about with equal agility.

The English name has been given to this animal from a vulgar idea that it is animated horse-hair; and we have heard a sensible person declare, that he has seen a horse-hair newly pulled and thrown into water assume all the motions attributed to the hair-worm.

The other genera characterized by Cuvier are six, namely, sabella, terebella, penicillus, siliquaria, eunices, and spio.

One genus of animals, termed *planaria,* has generally been admitted into this division by modern naturalists, though lately removed by Cuvier to the next order. It consists of numerous species which inhabit fresh water, and agree in having a horizontal depressed body, nearly of a gelatinous consistence; a terminal mouth; and a belly with two openings, but without a distinct abdominal cavity. As they have evidently ramified blood-vessels, and never inhabit other animals, they seem more properly placed in this order, though the species vary so much as to make it doubtful whether they should not be separated into different genera, or even into different orders. Some very sensible "Observations" on this tribe were published by Mr Graham Dalyell, tending, among other things, to shew that the mouth in all planariæ is not terminal, but in some species is near the middle of the body, and furnished with a proboscis.

ORDER III. *INTESTINA.* INTESTINAL WORMS.

The animals of this order agree in having a soft body without rings or segments, unattached, and readily examined by the naked eye; no distinct head, but only a mouth without feelers; and in being parasitical, or taking up their abode in the bodies of other animals.

General structure.—Their organization is much less perfect than in either of the former orders. Their motions are obscure, and performed by means of the muscular fibres that form a part of their integuments. They have no apparent nervous system, except a few indistinct filaments; and they appear to possess rather *sensitivity* than *sensibility.* The digestive organs are the most complete. All have a mouth formed for sucking and imbibing liquids, and leading to an alimentary canal more or less convoluted, sometimes floating loose within the cavity of the body, sometimes distributed through the substance of the body, and in a few cases forming the chief part of the animal. Neither heart nor apparent vessels are known; and no distinct organs of respiration have yet been discovered.

All the species to be here noticed live within other animals, occupying different parts, as the skin, the bowels, or other cavities, the liver, and even the brain, according to their form and nature. So extensive is the diffusion of worms, that scarcely any animal is exempt from this intrusion at some period of its existence. Not only man, quadrupeds, cetaceous animals, birds, reptiles, fishes, but even insects and other worms, become the residence of these parasites; and though they frequently produce serious and sometimes fatal diseases, according to their structure or number, it is certain that, in most cases, the animals in which they live suffer but little inconvenience. How they enter the bodies of other animals, or by what means they are thus generated, is a problem in natural history which has never been satisfactorily solved. Some suppose their ova are introduced through the medium of the food, drink, or air, though such animals have not been detected in any external situation where such ova could be produced; most of them are found incapable of supporting life when exiled from their natural habitations, and, therefore, others have contended that they must be produced within the animals which they infest by some mysterious process which they call equivocal generation; and a very sensible writer, Dr Baillie, in his Morbid Anatomy, is of opinion, that on comparing the whole evidence in support of both hypotheses, the grounds for believing that in some orders of animals equivocal generation takes place, appear stronger than the arguments for a contrary doctrine.

Intestinal worms may be divided into sections, according as they are constructed with an evident abdominal cavity, containing the viscera, or have the viscera dispersed or ramified throughout their substance. Of the genera to be here described, the first four belong to the former division, and the rest to the latter.

GENUS 1. *Filaria.*

Char.—Body cylindrical, thread-shaped, regular, smooth, but rather stiff; often of considerable length. Mouth terminal, orbicular.

The filariæ in their general appearance resemble hair-worms; but as they are always found in the bodies of animals, they are properly distinguished. In their structure they are the most simple of all the worms which have abdominal cavities, though from their slender size it is difficult to examine them so as to fix the characters of the species. In general they are uniformly cylindrical, but a few have the extremities tapering. They are found within the cellular membrane of man, quadrupeds, birds, fishes, and insects, and are distinguished chiefly by their length and the form of their body. Lamarck describes nine species, of which only one possesses much interest.

SPEC. 1. Fil. *Medinensis.* Guinea Worm.—*Char.* Body very long, with the point of the tail bent; margin of the mouth tumid.

The body sometimes attains the length of two feet, and is of a pale yellow colour. It is found in all the warm countries of Asia, Africa, and America, where it infests the cellular membrane of man, especially about the legs and feet, though it is occasionally seen in most parts of the body. The negroes in the West Indies are particularly subject to it, and it is there supposed to be introduced from without, and imperceptibly to insinuate itself below the skin. When it attains a moderate length, it occasions inflammation of the part, with tedious suppuration, and not unfrequently mortification, and when situated about the joints, ligaments, or tendons, it excites severe pain and convulsive twitches. It may sometimes be felt below the skin like the string of a violin, and when suppuration takes place its head may generally be distinguished. When the worm is pulled even with a slight force, the action excites very great pain, which sometimes becomes exquisite; but as the sore will not heal till the animal be extracted, the patients readily submit to this necessary but painful operation. But the extraction requires to be cautiously made, as, if the animal be broken, the severity of the symptoms is said to be increased. The method employed is first to search for the extremity of it in the small ulcer which usually accompanies the inflammation, and having got hold of it, the worm is wrapped round a piece of rag and gently pulled, using as much force as possible, without endangering the breaking of the body. When no more can be withdrawn, the portion extracted is suffered to dry, and the sore covered with the proper dressings, and successive operations are employed from time to time till the whole be withdrawn.

GEN. 2. *Ascaris.*

Char.—Body long and cylindrical, usually tapering at the two extremities, and having three little valves covering a small terminal mouth at the anterior extremity.

This genus constitutes one of the most numerous assemblages of intestinal worms, about eighty species having been distinguished by systematic writers. Such as have been dissected, shew a straight intestinal canal; and in some, which are supposed to be females, a double bag, many times longer than the body, forms a receptacle for eggs, and opens without by an orifice, at the distance of one-fourth of the length of the animal from the mouth. The species are found in all animals, and are often seen in considerable numbers.

SP. 1. Ascaris *Lumbricoides.* Lumbricoid Ascar.—*Char.* Head a little curved inwards; tail a little obtuse; body marked on each side with a groove.

The long round worm, so commonly found infesting the bowels of children is the present species. It is often seen twelve or fifteen inches long, and as thick as a goose quill. Its ordinary colour is pale reddish yellow, or yellowish white, and when newly extruded it is semi-transparent. The body is smooth, and towards one end has a circular depression, in which is seen a small orifice; when first voided they are sometimes very lively, but in general are feeble and languid, and soon die. They are usually confined to the small, or upper intestines, sometimes in such great numbers that two hundred have been expelled from one patient. Often there are only two or three, and in a few cases the worm is solitary. When numerous, they sometimes enter the stomach, and are vomited up, or even creep out at the mouth; and they have been found, after the death of the patient, coiled or twisted together in a knot. They live on the chyle and nutritious juices that pass through the intestines, and hence produce leanness, paleness, and debility, by withholding from the body its due nourishment, while by their motions in search of food they excite pain, irritation, and irregular action of the bowels. They have been known to penetrate the stomach and escape into the belly, though this circumstance probably takes place after the death of the person, when the stomach is soft and easily penetrated. But sometimes they enter the biliary ducts, and have been seen in the gall-bladder.

An account of the symptoms which point out the existence of ascarides and other worms in the bowels, and the most successful modes of expelling or destroying them belongs to another treatise; but it is proper here to explain how the present species may be distinguished from the common earth-worm already described.

The common earth-worm has its extremities much blunter than those of the *intestinal*; its mouth consists of a small longitudinal fissure, situated on the under surface of a small rounded head, there being no appearance of the three vesicles so evident in the ascaris. On the under surface of the earth-worm there is a large semilunar fold of the skin, into which the head retreats, but this is entirely wanting in the ascaris; the vent of the earth-worm opens at the very extremity of the tail, and not, as in the ascaris, at a considerable distance from the tail. The ascaris also wants the transverse rugae which are so strongly marked in the earth-worm, as well as the broad yellowish band by which the body of the latter is surrounded. The internal structure of these two species of worms is also extremely different. In the earth-worm there is a large and complete stomach, consisting of two cavities; and the intestinal canal in the latter is likewise larger, and more formed into little bags than in the ascaris.

Sp. 2. Asc. *Vermicularis.* Thread-worm. (*Oxyurus Vermicularis*, Lamarck.)—*Char.* Body pointed, and tapering at the posterior extremity; mouth round, with a vesicular membrane on each side. When full grown, this worm is about half an inch long, and scarcely larger than an ordinary sewing thread. The head is blunt, and the tapering part of the body or tail occupies about two-thirds of the length, and terminates in a fine point; the skin is wrinkled and pellucid, so that with a magnifying glass the internal structure may be seen through it; the natural colour is a pale yellow, but it is occasionally seen of a brownish or pale green colour. The internal structure is very curious, exhibiting a short gullet, terminated by a roundish bag, which, together with the gullet, resembles the pestle of a mortar, and hence proceeds the intestinal canal, which is variously contracted and dilated, and terminates in an orifice at the point of the tail. Round this canal is a convoluted apparatus, more remarkable in some worms than in others, and which is supposed to constitute the ovaries of the female. These worms inhabit the large intestines in the human species, particularly in children, and produce much irritation from their brisk motions and great numbers. They multiply very rapidly, and sometimes to an astonishing degree. They are extremely lively, and are said to spring from one place to another. In general, when they are about to shift their place, they first move the head, turning it in every direction, keeping the tail fixed, and then turn the body from one side to another till they are ready to dart or spring forward. They often retain their lively motions for some time after being expelled from the body.

GENUS 3. *Trichocephalus.* (TRICHURIS, Gmel.)

Char.—Body long, cylindrical, much thicker at the posterior extremity, and gradually tapering towards the anterior extremity into a slender thread; mouth terminal, orbicular, and extremely small.

The accounts given by naturalists of this worm differ widely from each other; some, as Gmelin and Dr Hooper, considering the thicker extremity as the head, and the capillary thread the tail, whence the old name trichuris; whilst Cuvier, Lamarck, and others, exactly reverse this description, place the head at the smallest extremity, and, accordingly, have changed the name to trichocephalus. Five or six species have been enumerated, and five are distinguished by Lamarck.

SPEC. 1. Tri. *Hominis.* Human Tr.—*Char.* Capillary part very long; head indistinct; body of the male spirally twisted, that of the female nearly straight. See Plate 97. Fig. 7, 8.

This singular worm is about two inches in length, of which the tail forms but a very small part. At the lower extremity the skin is wrinkled, so as to form imperfect rings, and this part is terminated by a curved pointed tube, which was formerly considered a proboscis or trunk. The worm is found more frequently in the small than the large intestines, seldom in any great numbers, though upwards of twenty have been seen to come from a child six years old. They excite great irritation, and sometimes produce a mucous dysentery. The same species is sometimes seen in apes.

GENUS 4. *Strongylus.*

Char.—Body long, round, tapering at its posterior extremity, with that extremity very simple in the female, but terminating in the male by a membranous bag; mouth large, orbicular, surrounded with fringes or papillæ, situated at the point of the anterior extremity.

The animals of this genus are remarkable for exhibiting a more complete difference of sex in different individuals than any other intestinal worms. They are generally smooth, of a whitish or reddish colour, and their skin is very transparent, clearly displaying the parts within. Four species are distinguished by Lamarck; and they are found in the bodies of man, quadrupeds, and birds, occupying the intestines, the gullet, or the kidneys.

Gen. 5. *Echinorynchus.*

Char.—Body long and cylindrical, forming a sort of bag; mouth terminating in a single retractile proboscis, furnished with hooked prickles.

These worms infest the bodies of several quadrupeds, and are found in great numbers in the seal. They fix themselves to the membranes or viscera by the hooked prickles of their proboscis, and keep their hold very pertinaciously, sucking the juices of the animal, and even tearing its substance, so as sometimes to destroy its life. The species are very numerous, and they are often found in great numbers.

Genus 6. *Fasciola.* Fluke.

Char.—Body soft, oblong, commonly flattened, sometimes cylindrical, furnished with two distant pores, the one near the end of the anterior extremity, the other central, either lateral or below, the first forming the mouth, and the second the vent.

The species are numerous, but the following is the most important.

Spec. 1. Fas. *Hepatica.* Liver-fluke.—*Char.* Flat and of an oval form, with a very short, nearly conical neck; orifices round the vent larger than the mouth.

This species, sometimes called the gourd-worm, from its resembling the seed of that vegetable, is often found in the liver of sheep, and is by some supposed to be the cause of the *rot,* so destructive to these animals. The liver-fluke is about an inch in length, and has longitudinal furrows well marked on the back. It is usually found attached by a point at one extremity, and by another point about the middle of the abdomen. This species is said, by Lamarck, to be sometimes found in the gall-bladder of man.

Genus 7. *Tænia.* Tape-worm.

Char.—Body soft, very long, flattened, articulated, terminating at its anterior extremity with a protuberance, furnished with four lateral mouths formed for sucking.

Of all the intestinal worms the tæniæ are the most remarkable in their structure, the most numerous in their species, and probably the most injurious to the animals which they inhabit. In their general form they resemble a thin narrow ribbon of considerable length, and of a whitish colour, distinguished by transverse lines into numerous joints, which are commonly longest in the smallest species. After Bonnet discovered the swelling protuberance at the anterior extremity of these worms, it was generally believed that all the joints together formed but one animal; but naturalists are now disposed to think each joint a distinct worm, capable of preserving a separate existence, and that the whole forms a compound animal. Each joint has commonly a small orifice upon one of its edges, and sometimes a small perforated prominence, and within are numerous masses like buds, which are supposed to be ovaries, from which great numbers of eggs are produced.

Spec. 1. *Tænia Solium.* Common Tape-worm.—*Char.* Head nearly hemispherical, distinct, with an obtuse beak; neck enlarging forwards; foremost joints very short, those next them nearly square, the rest oblong, and all rather obtuse; marginal orifices irregularly alternate. See Plate 97, Figs. 9, 10.

The common tape-worm is occasionally found to infest the intestinal canal of the inhabitants of Britain; but is said to be more frequent in Germany and Holland. It is sometimes seen of a very great length, extending to several yards; but more commonly it is expelled from the body in small portions. The numerous joints of which the worm is composed have usually a very white colour. The head is nearly square, with a projecting part forwards, having a distinct circular hole in its middle, around which there are several curved shaped processes. There are four round prominent holes situated near the four corresponding angles of the square-shaped head. The head is articulated with the narrowest joints of the body, which become gradually broader towards the tail. The body is composed of thin flattened joints of unequal length, on the edges of which are seen a projection and very obvious aperture. The last joint of the body differs from the rest in being rounded off at the extremity, and having no aperture. The joints are pretty easily separated when the animal is alive, and the separated portions retain for some time their vitality, but lose their power of remaining in the intestines, and are therefore easily forced downwards by the peristaltic motion. They are generally confined to the small intestines, of which they often occupy the whole length. Tæniæ are said to be hermaphrodites.

Genus 8. *Hydatis.* Hydatid.

Char.—An external vesicle, containing within it a loose worm, almost always single. Body of the worm vesicular, filled with a watery fluid, gradually forming a slender neck, and terminating in a tip furnished with four sucking mouths and a hooked crown.

In considering hydatids as forming a distinct genus of worms we have followed Lamarck, who, with great propriety has separated them from the tæniæ, since they are not only entirely different in form, but are never found in the intestines. They occupy some other cavities of the body in man and other animals, and are occasionally seen in the liver, and even in the brain. They always consist of a roundish bag composed of a white pulpy matter, formed into two layers, possessing considerable contractile power, and containing a fluid which coagulates by heat. The usual colour is white or light amber. On the inside of an hydatid are commonly seen several smaller ones, seldom bigger than pin heads, which are probably young hydatids. They are sometimes attached to the larger worm, either at irregular distances, or so as to form small clusters, and they are also found floating loose in the liquor of the parent worm. Hydatids are seldom found single, but generally in groupes, sometimes detached, and sometimes adhering to each other. They have been seen inclosing each other like a nest of pill boxes. They are found of all sizes, from that of a small apple to that of a common pea. When they occupy a glandular organ, as the liver, they are generally contained within a common close membrane or *cyst*, but sometimes they hang loose on the outside, and extend into the neighbouring cavity. They appear to possess no other mark of vitality than irritability, in consequence of which they shrink or contract when touched, pricked, or scratched.

The real nature and origin of hydatids are still involved in considerable obscurity. That they are real animals can no more be doubted than that the moving bodies of a similar structure, found in certain liquors, are animated beings; but how they find their way into the situations where they are seen, or how they are there generated, it is impossible to explain. Their effects are various according to their size and numbers. They generally produce emaciation of the body, and sometimes dropsy, and in a few cases they have proved fatal, especially when forming tumours in the brain.

The genera of intestinal worms which have not here been noticed are chiefly the following: Hamularia, hæruca, cucullanus, sagittula, tetragalus, scolex, tentacularia, caryophyllæus, amphistoma, monastoma, polystoma, ligula, linguatula, and diceras.

ORDER IV. *ZOOPHYTA.* ZOOPHYTES.

In this last but most numerous order of invertebral animals, the organized structure is to be considered in its simplest form, and the animal economy in its lowest and least interesting character. Many of the species in this order are merely objects of curious enquiry, as contributing to fill up blanks in the scale of animated nature.

General view.—The zoophytes agree in one remarkable particular, that their parts are disposed about a common axis in two or more rays, or along two or more lines proceeding between the two extremities; and in some tribes this structure is so remarkable as to have obtained for them the name of radiated animals, a term more properly restricted to a particular section. The nervous system in these animals is scarcely evident, nor have they ever a real circulating apparatus, though in a few cases is seen an appearance of vessels probably destined for respiration rather than circulation. Only in two genera are found organs analogous to feet, though a great majority of the species have *tentacula* for seizing the food on which they live, or attaching themselves to fixed objects. The organs of digestion are often pretty complete, consisting of an intestinal canal more or less compound or convoluted, provided with two opposite openings, and the mouth is sometimes furnished with hard substances resembling teeth; but in other tribes the intestinal canal has only one orifice, and in many instances the whole animal seems nothing but a hollow bag with hollow arms, serving merely for the reception or absorption of the aliment.

In the proper zoophytes, excluding the intestinal worms just treated of, there is no distinction of sex, though in some tribes the young are produced from eggs, while in others they grow like buds on the body of the parent animal, and separate spontaneously when sufficiently developed and capable of providing for their own wants.

All the zoophytes are inhabitants of the watery element. Most of them are found in the seas and oceans; but many reside in fresh water, in various artificial liquors, or in certain fluids of other animals. They are remarkable for great tenacity of life and general irritability; so that it is difficult to destroy them, and many species may be artificially multiplied by cutting them in pieces.

The present order has been variously divided by different writers. Cuvier's division has been already noticed. In this treatise it is deemed advisable to deviate from the arrangement of that eminent naturalist, by omitting the intestinal worms, and comprehending his *echinodermata*, and *acalephes*, under the head of radiated zoophytes. In adopting the second and third section of polypes and animalcules, the classification of Cuvier and Lamarck has been followed without reserve.

SECT. I. *Radiata.* RADIATED ZOOPHYTES.

The distinguishing marks of this section, which, in the classification of Lamarck, constitutes a separate class of invertebral animals, are, that the animals are so far naked that none of them are enclosed in hard calcareous shells, though they have a leathery or crustaceous covering over the proper skin; that they are either entirely free, or only attached by suction to fixed objects; that the general form of their body is either circular or cylindrical; and, above all, that they have a radiated structure, not only in the conformation of their exterior, but in the arrangement of their internal parts; their mouth is situated on the inferior surface, and is either simple or compound; the digestive organ or stomach, and intestines, is generally composed of several communicating cavities; the breathing organs consist of external pores or tubes, through which the water, in which all these animals reside, is transmitted to and from the interior.

Some of them have a leathery or crustaceous covering, while in others the skin is extremely soft, and the whole body gelatinous and transparent. To the former belong four principal genera, and to the latter two, though these genera are by the French naturalists subdivided into numerous others.

GENUS 1. *Echinus.* SEA-URCHIN.

Char.—Internal integument solid, and immoveable; body nearly globular or flattened, without radiated lobes, and not contractile, covered with spiny tubercles, the bases of which are immoveable, but the spines are capable of motion; vent distinct from the mouth.

Part of the above character applies to these animals only in the perfect state when in their native element, or when newly taken from it; for the spines are easily broken off, leaving only the tuberculated shells. About the mouth of these animals there is a compound apparatus, consisting of five double flattened columns, of a very solid, almost bony texture, streaked transversely, presenting a toothed edge towards the centre, and terminating anteriorly in an oblique point. These ten solid plates are joined in pairs, and are strengthened externally, and at their base towards the bottom of the mouth, by 15 other pieces equally solid, but narrower, so that these 25 pieces are disposed in the manner of an inverted cone, the base of which is situated within, while its pointed lip appears at the entrance of the mouth, presenting five oblique points. Attached to this apparatus are several muscles, capable of giving it a common motion, by which it can crush the food introduced into the mouth without producing a true mastication. The stomach and intestines are of considerable length, and are disposed in nearly a circular form.

A considerable variety prevails among the numerous species of this genus or family, with respect to the form of the body and the situation of the orifices. Some have the body flattened, elliptical, or hemispherical; others have it of an irregular oval form; in some it is nearly conical, in others almost globular; in others heart-shaped, and in a considerable number spherical. Sometimes the mouth is in the centre, and at others approaches nearer to one side. These differences have induced the French naturalists to distribute the Linnæan echini under ten or eleven subordinate genera, most of which are inhabitants of the ocean, but some are found only in a fossil state.

Spec. 1. Echinus *esculentus.* Common or eatable Sea-urchin.—*Char.* Of a hemispherical, globular figure, with undivided porous bands, obscurely warty, and short spines; mouth central; vent vertical; shell marked with two divisions.

The common sea-urchin is found in rocky cavities within low-water mark in most of the coasts of the European seas, especially in the Mediterranean, and is sufficiently common on the British coasts, where it is frequently caught by fishermen, or cast ashore after a storm. Besides the spines, noticed in the description of the genus, these animals have numerous tentacula, rising from small knobs situated on the divisions of the shell in longitudinal rows. They are longer than the spines, and being terminated by suckers, serve to fix the animals to rocks or stones, as well as to secure their prey. The spines perform the office of feet, on which the animals are said to move, either by a sort of walking, or by a rotatory progression. The resemblance of the spines to the stiff bristles of the hedge-hog has occasioned the name of sea-urchin to be applied to this species. Most of its internal structure consists of fine fleshy bodies, containing numerous reddish grains, like eggs; and, when boiled, the inside forms very wholesome food, and is often eaten by the poor inhabitants of the coasts of France, Spain, and Italy. Hence these animals have also been called *sea-eggs.*

When these creatures are alarmed by the approach of an enemy, they are said immediately to move their spines towards the object, and wait an attack like an army of pikemen. Sea-urchins are so tenacious of the vital principle, that on opening one of them alive, and separating the divisions of the shell, the several parts have been observed to move off in different directions.

Genus 2. *Asterias.* Sea-star.

Char.—General form of the body roundish and depressed, divided at its margin into angular lobes or rays; lower surface of the lobes or rays having a longitudinal groove, edged on each side with moveable spines, and holes for the passage of tubular retractile feet; mouth inferior, and central when the longitudinal furrows meet.

The rays of a sea-star, or star fish, are generally five or more in number. The outer integument of their body consists of small solid pieces, variously combined. Besides the tubular feet, the whole surface is beset with tubular pores, through which the water enters and returns by a kind of respiration. Over the middle of the body, or a little to one side, is found a bony plate, of which the use is unknown; within is a large stomach joining the mouth, and provided with as many double intestines as the animal has rays, proceeding from the stomach to the tip of each ray, and ramified like the boughs of a tree.

By the crust with which these animals are covered, they are in some measure defended from the attacks of their marine enemies, and by the tentacula attached to their rays they seize small worms or shell-fish, and carry them to the mouth, where the latter are broken by the bony processes with which that opening is furnished. The rays are very brittle, even when the animal is alive, but are readily reproduced.

Reckoning the sub-genera into which this genus has been divided, about 70 species have been distinguished by modern naturalists. One of the most curious and beautiful is the following.

Spec. 1. Ast. *Caput Medusæ.* Arborescent Sea-star.—*Char.* Back of the disc marked with ten prominent ridges, disposed in pairs, and abrupt at the tip; rays two-cleft, very minutely divided, and ridged transversely. See Plate 97. Fig. 11.

The general appearance of this species, from the minute subdivision of its rays, is so very different from that of the common sea-star, that Lamarck has separated it, with a few others that have the same peculiarity, and formed them into a new genus, *euryale.* The division of the rays is so minute that some pretend to have counted 8000 branches, and some individuals have been caught in the Indian seas that were three feet in diameter, and sold for ten rix-dollars. The general colour is a fine red or dark carnation.

Genus 3. *Holothuria.*

Char.—Body full, soft, thick, and cylindrical; very contractile; covered with a leathery and commonly papillary skin; mouth terminal, surrounded with minutely divided branched tentacula, and furnished with five calcareous teeth or bony pieces.

The holothuriæ are remarkable for the readiness with which they retract their tentacula and respiratory organs, and again spread them in the water. The intestines of these animals are long and complicated; and so great is the contractile force of the body, that it is sometimes burst, and the intestines are exposed.

Spec. 1. Hol. *Cuvieria.* Cuvier's Holothuria.—*Char.* Lower surface flat, soft, and furnished with numerous feet; upper convex, and strengthened with bony scales. See Plate 97. Fig. 12.

A native of the North sea.

Including the subdivisions of this genus by Lamarck, there are about 30 species.

Genus 4. *Sipunculus.* Tube-worm.

Char.—Body long, nearly cylindrical, naked, contracted towards the posterior extremity, and terminating there in an enlargement; anterior extremity forming a contracted, cylindrical, truncated neck.

By Linnæus and his followers this was ranked among the intestinal worms, and in reality it forms a good connecting link between the proper worms, the annelides, and the radiated zoophytes, resembling more the second order than either the first or third. The body is formed into slight rings by foldings of the skin; there are two openings at no great distance from each other; and the intestinal canal commences at the one, and, after proceeding to the posterior extremity, makes a turn back and terminates in the other. These animals lie buried in the sand, and appear to feed on the decayed remains of vegetable and animal matter. About five species are now known,—of which one, found in the Indian ocean, is eaten by the Chinese, and has thence been named *sipunculus* (or *lumbricus*) *edulis.*

Genus 5. *Actinia.* Animal-flower.

Char.—Body cylindrical, fleshy, simple, contractile, capable of fixing itself spontaneously by the base; mouth terminal, dilatable, and contractile, surrounded with numerous tentacula arranged in one or more rows, and, when expanded, giving the appearance of a flower.

Other zoophytes beside the present genus have been denominated animal-flowers, especially some species of holothuria and tubularia, though the last is by some regarded as an amphitrite; but the actiniæ are more peculiarly entitled to that appellation from the various shape and colour of the tentacula. These animals are generally broadest at their upper extremity; but the cylindrical body sometimes terminates in an expanded base. The body is not only extremely contractile, closing on a finger or other object inserted at the mouth, but it is also very dilatable, and capable of being inflated with air, or expanded with water to a considerable degree, so as to extend far over the base. The tentacula are hollow, and also capable of inflation, and they appear to be open at their distant extremity, so as to attach themselves to such objects as they are to seize, by suction. The animal can occasionally turn itself inside out, which it often does when in want of food. The manner in which actiniæ are naturally propagated is very curious. They are properly viviparous, the young being produced within the body of the parent, and, when sufficiently perfect, received into the stomach and expelled by the mouth; but their artificial propagation is still more curious. They may be divided by a knife or pair of scissars, either longitudinally or transversely into several parts; and if placed in favourable circumstances in sea water, each part will gradually become a perfect animal, form of itself a body and tentacula, attach itself by the base to such fixed objects as present themselves, and seize such small animals as are put in its way. Nay, so great is their reproductive power, that when one of them is torn, in attempting to remove it from its natural residence, the fragment of the body which is left gradually shoots up, expands, and supplies the deficiency of all the parts which had been torn away.

Although generally found attached to a rock, stone, or other object which cannot be easily borne away by the waves, actiniæ can readily disengage themselves, and change their situation when disturbed, or when their natural supply of food diminishes. They are extremely voracious, and greedily seize on worms, small crabs, shell-fish, and similar prey, which they gradually bring to their mouth by attaching to them their tentacula successively, till they have made sure of their capture. As they have no solid organs that can supply the office of teeth, they swallow these animals whole, and after the bodies are dissolved by the juices of their stomach, the shells are expelled whole.

From the various colours of these animals, especially of their tentacula, they have been likened to several of our most showy flowers, and called sea anemones, sea marigolds, sea pinks, sea sunflowers, &c. They are found in most seas near the coast, and some species are common in the firth of Forth, and on most rocky parts of the British coasts, especially near Hartlepool and Plymouth. They are most readily seen on rocks which are covered by the sea at high water, while they are left nearly dry at the ebbing of the tide. When not covered with water, and when the weather is cold or cloudy, they remain in a contracted state, with their tentacula drawn back towards or within the mouth; but when the water flows over them, and particularly in calm weather, and a bright sunshine, they fully expand themselves, and completely resemble the blossoms of flowers glowing with the most vivid colours.

The proper actiniæ have only a single body or stem; but others of the same family are seen more or less branched, or like several flowers growing from a common root. These species have lately been separated to form the genus *zoanthe.*

The example given to illustrate the genus actinia, (Fig. 13. Plate 97.) is the scarlet actinia, (Ac. *coccinea*) distinguished by being variegated with white and red, and having tentacula that are cylindrical and ringed. It is found on the coast of Norway.

Gen. 6. *Medusa.* Sea-nettle.

Char.—Body detached, gelatinous, orbicular or hemispherical, smooth or convex above, flattish and radiated below, with numerous tentacula; mouth inferior and central. The form of these animals is peculiar. The upper surface of the body resembles a mushroom not fully expanded, and is sometimes called umbrella. The body is perfectly transparent, resembling a clear tremulous jelly; but it is so far contractile as to be rendered more or less flat or convex according as the animals move downwards or upwards in the water. Within are commonly seen radiated coloured lines. The mouth is sometimes a simple opening, but it is often prolonged downwards into a tube, and the tentacula in the true medusa are regularly disposed around it, and seem intended not only for seizing prey, but to assist the animal in its progressive motion through the water. When in their native element, the medusæ make a brilliant appearance, especially when the sun shines on them as they approach the surface of the water. They swim about with great agility, and those species which have coloured tentacula are readily distinguished; but when cast ashore, they speedily lose all signs of vitality, and their body melts away on the sand to a mere film. They are of various sizes: some being seen of two or three feet diameter, while others are not larger than a pigeon's egg.

The circumstance of their irritating or stinging the skin of persons with whom they come in contact, whence the name *sea-nettle* has been given them, seems exaggerated, though the skin of bathers touched by them is sometimes seen slightly red; and delicate females, probably more from alarm than the irritating power of the animals, are sometimes thrown into considerable agitation. The smaller species are said to form a principal share of the ordinary food of the toothless whales. They are found in all parts of the ocean, and the sea about Greenland and Davis' straits particularly abounds with them. Mr Scoresby in his Account of the Arctic Regions, speaks of a species of medusa so small and so numerous, in the Greenland seas, that 64 of them are contained in a cubic inch of water, allowing an interval of a quarter of an inch between every two.

Numerous other genera and sub-genera of radiated zoophytes are described by modern naturalists, especially what are denominated *lucernaria*, *beroe*, *rhizostoma*, *cestum*, *diphyes*, *porpita*, *velella*, *physalia*, *physophora*, and *stephanomia*; but what are above described are the most interesting.

SECT. II. *Polypina.* POLYPES.

Under this appellation are here included those animals which are of a gelatinous texture, have the body of an elongated form, and contractile, with no other internal organ than an intestinal tube, with scarcely ever more than one aperture. The mouth is distinct and terminal, and surrounded with tentacula, or radiated lobes, or furnished with moveable hairs. Most of them propagate by buds that are either contained within the animal or growing on the outside, and sometimes these buds appear in groupes. In some tribes or species the polypes are single, but in most they are crowded together, and often situated like leaves or flowers on a common stem, forming a compound animal. In this last state, they are called *corals* and *corallines*, and were long considered submarine plants, which while below the water are soft and flexible, and grow hard on exposure to the air. Others of these compound polypes resemble a mass of stone, commonly of a rounded form, as most of those kinds called *lithophytes*.

In their internal structure, the polypes are extremely simple, generally having only a single cavity for the reception of aliment, though, in a few instances, this cavity communicates with several tubes or hollow vessels; but there is no appearance of nerves, gills, or other breathing organs, or of circulating vessels. Some polypes float loosely in the fluid which they inhabit,—some are attached to certain water plants, from which they hang in an inverted position; and others are fixed to rocks by a root, and shoot up into innumerable branches, or spread out into an irregular mass, often of considerable extent. They are all found in water, or watery situations, except a few lithophytes, which have as yet been discovered only in a fossil state.

According to their appearance and composition, polypes have been subdivided into *naked*, or such as are soft throughout, of a membranous or gelatinous texture, and more or less transparent, including the genera *hydra*, vorticella, furculania, *brachionus*, and some others, and compound polypes, most of which are *cortical*, or are composed of an internal solid part covered with a membranous or fleshy bark, comprehending a great number of genera, the principal of which are, *tubipora*, *tubularia*, *sertularia*, *cellularia*, *flustra*, *corallina*, *antipathes*, *gorgonia*, *isis*, *madrepora*, *millepora*, *pennatula*, *alcyonium*, and *spongia*.

GENUS 7. *Hydra.* FRESH-WATER POLYPE.

Char.—Body oblong, of a linear or inverted conical form, narrowest below; gelatinous and transparent, fixing itself spontaneously by the base; mouth terminal, surrounded with a single row of tendril like tentacula.

These small animals, some of which are barely visible to the naked eye, are among the most curious productions of animated nature. They are commonly seen in ditches and marshy situations; but it requires some care and attention, in a person not used to examine them, to discover them. They have the power of contracting or rolling themselves up when disturbed into very small compass, so that many do not exceed the size of a pin head; or they can, when seeking for food, expand their bodies and tentacula to various lengths, and move them in all directions. While in this expanded state some species are about an inch and a half in length, the length of their tentacula being usually the same as that of the body. When they entangle a small worm or insect in their tentacula they convey it immediately to the mouth, often twisting their tentacula in a spiral manner to accelerate the action. M. Fontana, who made many observations on these animals, was of opinion that they possessed some active poison, as immediately on their touching a worm with their lips they deprived it of life, though no wound could be discovered on the body. Polypes are very voracious, and devour worms of a proportionally large size. When satiated they contract themselves, and remain for some time in a state of inactivity, till, as the food is digested, they gradually again extend their tentacula for fresh prey. From the transparent nature of their bodies, the motion of the aliment in polypes has easily been detected by observers, especially when snails or coloured worms are given to them for food. After being digested for some time in the stomach the aliment is reduced to small fragments, which are driven about backwards and forwards through the stomach and ramifications of the intestinal cavity that occupy the interior of their tentacula. The excrementitious parts are rejected by the mouth.

Polypes can climb up the aquatic plants that grow in their haunts, walk on the surface of water, and move in various directions, by means of the power they have of contracting and elongating their bodies and tentacula, and of seizing hold of fixed objects with their tail or tentacula.

The skin of a polype, when examined with a good microscope, has the appearance of shagreen, and seems to invest not only the whole body and tentacula, but also the intestinal cavity. The mouth is situated in the middle of the tentacula, and assumes various shapes, according to the state of the polype, being sometimes elongated and sometimes hollowed.

The manner in which these animals are propagated is very curious, and is best observed in the larger species, (H. *fusca*, or H. *grisea*.) In summer when they are most active and lively, small tubercles are observed proceeding from the sides, and gradually increasing in bulk, till in a few days, the tentacula appearing first, the complete polype is developed adhering to the parent only by the extremity of the tail. While this attachment remains there is a communication between the intestinal cavity of the polype and that of the offspring, and food passes reciprocally from the one to the other. The tail of the young polype generally becoming smaller, is at length detached from the parent by a jerk. Sometimes the young polypes are fully formed and ready to drop off in 24 hours, but in cold weather about a fortnight is required to bring them to perfection. The young are produced indiscriminately from all parts of the parent body, and nine or ten have been attached to one parent.

The artificial multiplication of these polypes may be effected by cutting them either transversely or longitudinally, and even from a small portion of the skin a new and perfect polype may be produced. Monstrous polypes with two mouths or two basis may be formed by slitting one half-way from above or from below. One polype may be united to another by making a cut in each, and placing the cut parts in contact; and they may be turned inside out and still carry on the digestive process.

About six species have been described by naturalists. One of them, H. *viridis*, or green polype, distinguished by being of a green colour, and having the tentacula shorter than the body, is represented at Fig. 1. of Plate 98.

GEN. 8. *Vorticella.*

Char.—Body contractile, pedunculated, adhering by the base spontaneously or constantly to other objects; with the upper extremity turgid, and terminating in a large mouth furnished with rotatory cilia.

This genus and the two following were formerly ranked among infusory animalcules, but have been lately separated with propriety, as the species, though small, are seldom so minute as to be deemed microscopic, and are not found in vegetable or animal infusions, but in the sea or in fresh water. They also differ from those animalcules in having a distinct mouth.

The vorticellæ, of which about 28 species are known, occur in various watery situations,—some in sea-water that has been long kept,—some in stagnant water,—attached to the plants or animals which inhabit those situations. They are fixed by a pedicle, which is either simple or branched, and terminates at the top in an expanded portion, or in several resembling cups or bells. From the cups arise two sets of filaments opposite to each other, which are in continual rotatory motion, and seem to attract the nutritious particles that float near the animal. About 28 species are accurately distinguished; and, among these, the following is one of the most striking.

SPEC. 1. Vor. *Acinosa.* Grained V.—*Char.* Compound, the bells globular, and marked with blackish dots. See Plate 98. Fig. 2.

Inhabits stagnant waters.

GEN. 9. *Furcularia.* WHEEL-ANIMAL.

Char.—Body contractile, detached, oblong, ending behind in a double tail; mouth furnished with a single or double rotatory organ.

The wheel-animals are very singular, from their complicated structure, the rapid motions of their wheels, and the wonderful power which some of them possess of remaining for a very long time in an apparently lifeless state, and repeatedly reviving under favourable circumstances. They have a distinct head, neck, and tail; a stomach communicating with the mouth; and an intestine ending in a vent near the mouth.

Of 13 species distinguished by peculiar characters, the most remarkable for its revivifying powers is,

Fur. *Rediviva.* Reviving Wheel-animal.—*Char.* Cylindrical, with a pointed projection on the neck, and a four-pointed tail.

This species, like most of the others, is found in stagnant water, especially in rain water which has remained for some time in sandy gutters, or on the eaves of houses that are roofed with tiles. As long as the water remains, the animals are very lively and active, continually swimming about, changing their figure, and moving their rotatory organs with great velocity; but as the fluid wastes they become languid and contracted, gradually cease to move their wheels, and draw them within the mouth; and when the water is dried up, they become inanimate and shrivel into a point, not to be distinguished but by an experienced eye as the remains of a living animal. When in this state they may be kept for weeks, months, or even years, and if replaced in water they by degrees expand, recover their animation, and all their former actions. This revivifying process requires different times for its completion. In some instances the animal recovers its faculties in a few minutes, while in others more than half an hour elapses before its proper motions can be observed.

GEN. 10. *Tubipora.* PIPE CORAL.

Char.—Substance stony, composed of cylindrical straight parallel tubes separated from each other, but joined by external transverse partitions. Tubes jointed, and communicating with each other through the partitions that unite them. The only species now acknowledged as belonging to this genus is *Tubipora musica*, or organ coral, from the striking resemblance which a single row of it bears to the pipes of an organ. It is found in the Indian ocean and the Red sea, is generally of a purple or rich crimson colour, and specimens of it have been found two or three feet in diameter.

Gen. 11. *Sertularia*. Sea Bristle Coralline.

Char.—Stem plant-like, horny, with thin fistular, simple ramified trunks, furnished with tooth-like cells at the sides. Cells cup-shaped, distinct, and prominent, bearing vesicles that produce buds, and are larger than the cups. See Plate 98. Fig. 3.

So great is the similarity which most species of this genus bear to plants, that they are uniformly described by naturalists as sea mosses or ferns. They are attached to rocks or shelves by creeping processes, which resemble spreading roots. The outer part of the stem and branches is horny, and so transparent that the softer animated parts within may be seen like a sort of pith shooting out a polype with its tentacula at each denticulation. Lamarck describes 23 species, of which Sert. *halecina* is represented at Fig. 3.

Gen. 12. *Corallina*. Coralline.

Char.—Stem fixed, very much branched, composed of a central axis, and an articulated calcareous crust, without any appearance of polypes.

In this genus the polypous animals, which probably inhabit some part of the branches, are not to be distinguished, but the whole body appears one homogeneous calcareous mass. Of more than 32 species which are distinguished by systematic writers, only one C. *officinalis*, Officinal coralline, need be particularised, as having formerly held a place in the Materia Medica. This substance, on certain coasts, covers all the bottom of the sea, and is of a white, reddish, or greenish colour. It was employed as an absorbent or antacid.

Gen. 13. *Gorgonia*.

Char.—Stem fixed, arborescent, composed of a central axis that is horny and flexible, and a soft fleshy bark exhibiting in the recent state polypes, furnished with a row of eight tentacula about the mouth. This numerous genus, of which about 50 species have been accurately distinguished, contains some of the remarkable and beautiful marine productions which belong to the present order.

Spec. 1. Gorg. *Flabellum*. Sea Fan.—*Char.* Very much branched, flattened, and spread out in the form of a fan of a reticulated structure, composed of very numerous thickly set twigs, united together with small scattered pores, from which appear the polypes.

It is found chiefly in the Indian Ocean, the American seas, and the Mediterranean, and often grows to a very large size, specimens of two or three feet in length being occasionally seen in cabinets. The prevailing colour is purple. See Plate 98. Fig. 4.

Gen. 13. *Corallium*. Coral.

Char.—Stem fixed, arborescent, but not jointed; inflexible. Axis stony, solid, and streaked on the surface. Bark, in the recent state, soft and fleshy, with scattered cells, having eight valves, and producing polypes with eight tentacula. See Pl. 98. Fig. 5.

The beautiful substance called red coral, after having run the gauntlet through two or three genera, being considered an isis by some writers, and a gorgonia by others, has at length been formed into a separate genus under the old name corallium, where at present it stands alone.

Red coral is obtained by the fishers from large beds or reefs in different parts of the Mediterranean sea, along the coasts, and near the islands. The apparatus employed by the fishers, consists of two cross beams having a leaden weight to sink the wood to the bottom, and several strong nets and some loose hemp attached to entangle the coral branches, with a strong line for the purpose of directing the cross beams, or hauling up the coral entangled in the nets. This substance has a very different appearance when newly obtained from its watery bed, to that which it usually exhibits in this country. It is then covered with a fleshy external layer, which has numerous polypes extended through it. This external layer is removed before it is exposed for sale.

Gen. 14. *Isis*.

Char.—Stem attached, arborescent, composed of a central axis that is jointed, streaked, and of a stony consistence, and of a soft incrusting bark, producing polypes, but not closely or permanently adhering to the axis.

Of about five species, the most remarkable is Is. *hippuris*, the black and white jointed coral, found in the Indian ocean.

Gen. 15. *Madrepora*. Madrepore.

Char.—Internal substance stony, variously shaped, but always exhibiting an appearance of little depressed cuts, generally star-like, and arranged in various lines, with intermediate pores. Outer bark in the recent state fleshy or mucous, bearing polypes.

The madrepores can be seen in perfection only when newly taken from the sea, and while their inhabiting polypes are alive; for, in the state in which they are usually met with, they appear mere masses of stone, some of a rounded form, some branched, others like flat plates, &c. But in the recent state these stony bodies are entirely covered with a soft gelatinous mass, displaying every where the tentacula of its polypes, and readily contracting when touched, thus proving its animal nature.

As the species are very numerous, amounting to at least 100, Lamarck has subdivided them into several subordinate genera, according to their general figure. One of the most curious species is the Brain madrepore, or brain stone, Mad. *cerebrum* (*Meandrine cerebriforme* Lam.,) figured at Fig. 6. of Plate 98. distinguished by being nearly globular, and having the surface of the stony part formed into undulating prominences and hollows, the former of which are flattened at the top. It is found in the American seas, and varies in size from a few inches to above two feet in diameter.

Genus 16. *Millepora*. Millepore.

Char.—Internal substance stony, having its surface marked with numerous holes or superficial pores.

This genus was formed by Linnæus for separating many species of coral which had formerly been confounded with the madrepores. It is much less numerous than the preceding, but, like it, has been parcelled out into several subdivisions.

GEN. 17. *Pennatula*. SEA PEN.

Char.—General stem detached, formed for swimming, regularly branched or lobed; composed of a central stony axis, covered with a fibrous fleshy skin, bearing polypes at the extremities of the branches.

The *Pennatulæ* constitute a very singular tribe of marine animals. They may be regarded as compound polypes, consisting of a common body, which forms the fleshy part of the stem or barrel of the quill, and from which numerous filaments are sent off by the branches or *barbs*, and terminate in as many heads, furnished with tentacula. Some of the species, in form, and one even in colour, might be mistaken for a floating animated quill, moving about in the sea by the contraction and dilatation of its fibres. Some of them emit a phosphorescent light, so strong as to discover objects that are contiguous to them. They are often found attached to the bait of fishermens' nets, especially in the seas of warmer climates.

GEN. 18. *Renilla*.

Char.—Body detached, flattened, kidney-shaped, and furnished with a footstalk, having one surface marked with radiated streaks, and the other bearing polypes with six tentacula.

The only species which belongs to this genus was long ranked among the pennatulæ; but as in form it materially differs from the proper sea-pens, Lamarck has very properly formed of it a new genus. It consists of an expanded flattened kidney-shaped body, rising from a short worm-like stem, and on one side are numerous tubular orifices, through which the polypes protrude their tentacula, or withdraw them at pleasure. It is a native of the seas round the West Indian islands, and is of a fine crimson colour on one side, and a yellowish-red on the other. See Plate 98. Fig. 7.

GEN. 19. *Alcyonium*.

Char.—General receptacle of the polypes of various forms; soft or fleshy in the recent state, but hard or leathery when dried; composed of very small horny fibres, interwoven and covered with a permanent pulp; surface generally exhibiting orifices, from which proceed polypes which have usually eight tentacula.

This genus, like most others in the Linnæan class of Vermes, has undergone considerable alteration since Gmelin published the 13th edition of the *Systema Naturæ*, in which he characterized 28 species, of very various textures, many of them shewing no appearance of polypes. Lamarck has increased the number of species to 40, though he has excluded several enumerated by Gmelin. In general, the interior of these zoophytes, in the recent state, is of a gelatinous consistence without a bony axis. The coral represented at Fig. 8. of Plate 98. is the Alcy. *gorgonoides* of Ellis, and forms a beautiful specimen, brought from the American seas.

GEN. 20. *Spongia*. SPONGES.

Char.—Common receptacle attached, soft, gelatinous, and in the recent state irritable; tenacious, flexible, very porous, and absorbing water when dried; axis consisting of numerous horny flexible fibres; external covering gelatinous, exhibiting fibres containing polypes of unknown structure and transient appearance.

The sponges, though evidently possessed of irritability, are the most torpid of the zoophytes. They are formed of numerous ramified capillary tubes, by means of which the surrounding water is absorbed and expelled by the contractile power which they possess. The numerous species, amounting to about 140, differ chiefly in their external form, or in the internal structure of their capillary tubes.

The common sponge (S. *officinalis*,) is of no regular or constant figure, but usually lobed, very elastic, rough on the surface, and of a woolly texture. It is obtained chiefly from the Mediterranean, where it is found adhering by a broad base to the rocks about the islands in that sea. It is also found in the Red sea and Indian ocean. When newly taken up by the fishermen it is covered with a gelatinous substance which smells strongly of fish, but which is carefully removed, and the sponge well cleaned to prevent its spoiling. When cut perpendicularly, the internal structure is seen consisting of small tubes, which ramify into numerous divisions, and terminate on the surface in small pores. These pores are regarded as the mouths of the animal, and are surrounded by numerous small erected fibres which seem to be interwoven. When cleaned and dried, the sponge forms an article of commerce of considerable importance. See Plate 98. Fig. 9.

SECT. III. *Infusoria*. ANIMALCULES.

Descending along the scale of animal existence, we are now arrived at the lowest link; at that division which exhibits the animal structure in its simplest form and most minute appearance. The beings now to be considered differ from all that have been yet described in this treatise, in having no perceptible aperture to the internal cavity, and in the frequent change of shape which they undergo when sporting in the fluids they inhabit. Although the size of these beings be extremely small, they are highly interesting in many points of view, and have hence attracted the notice, and employed the talents of several distinguished naturalists, as Leuwenhoeck, Muller, Bonnet, Spallanzani, and Lamarck. The circumstances most worthy of attention respect their structure, size, numbers, habitations, motions, modes of multiplication, and varieties.

Structure—The body of these animalcules is nothing but a gelatinous transparent membrane, without orifice or any visible internal organ, of form infinitely varied in the different species, and frequently varying in the same species. Some are long and slender like a worm; some oblong; and others cylindrical or flat; others are globular; and others again are of various angular forms. In some there is an appearance of external organs, as a tail and projecting filaments or bristles; but many have nothing of this kind, and are mere homogeneous contractile membranes, capable of absorbing fluids.

Size.---Nothing is more remarkable than the extreme minuteness of animalcules. Few of them are visible to the naked eye; and many are so diminutive, that the most powerful microscopes show them only as moving points. They have been stated to bear the same proportion to a *mite* that a bee bears to a *horse*; a loose comparison, but sufficient to give a general idea of the minuteness of these animals. Again, it has been computed, that 10,000 of some species placed close together would occupy a space not larger than an ordinary grain of sand. Now, as each of these scarcely visible bodies must consist of a congeries of moving particles, how inconceivably minute must be the individual atoms!

Numbers.—It is impossible to calculate the innumerable multitudes of animalcules that are to be found in some fluids; but the numbers vary with particular circumstances, being generally greatest in those fluids which are freely exposed to the open air, and least in such as are entirely excluded from it. The temperature of the fluid also has an influence in this respect. Extremes of heat and cold, that is, a heat above 95°, and a cold amounting to 32° of Fahrenheit, commonly soon destroy them.

Habitation.—Scarcely any fluid, animal, vegetable, or mineral, except what are impregnated with metallic or poisonous substances, is destitute of animalcules; but they are most abundant in stagnant waters, in which certain vegetables grow, in rain water that has stood long in the air, in vegetable infusions, in vapid vinegar, in animal decoctions that have been some time kept, in old sea water, and in certain animal fluids. When a drop of any of these fluids is placed in a proper vessel, as a watch-glass, and submitted to inspection with a powerful microscope, certain species of animalcules are seen moving through it with a velocity congenial to their nature. They differ from all other known animals, in being found equally in all countries and all climates where their history has been studied.

Motions.—The motions of animalcules are extremely various. Some dart through the fluid with a velocity which renders it difficult for the eye to follow them, while others appear to drag themselves along with pain, and labour as if their bodies were too unwieldy for their strength. Such have been called *sloths.* Animalcules can move in all directions, as well against the stream as with it. Some proceed with an undulating motion like an eel; others move in circles, or various other curvilinear directions. The motions of some appear to be made about a fixed point as a centre, and a few roll along like a wheel or hoop. Sometimes they move backwards and forwards, as if in pursuit of each other. It has even been said that they know how to avoid obstacles, or to prevent any interference with one another in their motions; but this is asserting too much, and attributing intelligence or instinct to beings without a nervous system.

Multiplication.—Most animalcules are viviparous, and multiply by spontaneous division of their body; others are observed to produce buds which separate, like those of polypes; and a few are said to lay eggs, but the small bodies that have this appearance seem rather to be young animalcules contained within the body of the parent, from which they are extricated by the bursting of the living capsule that gives them birth. Sometimes several successive generations of animalcules have been observed within a single progenitor. The process of spontaneous division in these animals is very curious. They generally execute it by a rapid centrifugal motion of the body; and when the motion has continued for some time, a contraction begins to appear in some part of the animal, and, gradually increasing, forms the line of separation by which two animalcules are produced from one.

Varieties.---Exclusive of the animalcules noticed in the last section, about 145 species have been characterised by systematic writers; but it is probable that only a very small portion of those which really exist have been discovered. The genera are divided, according to this complexity, into such as are furnished with external organs and such as have none. To the former belong four genera, and to the latter ten.

Gen. 21. *Furcocerca.*

Char.—Body rarely ciliated, but furnished with a forked or two cleft tail.

This genus has been formed by Lamarck, to separate eight species of Muller's cercaria which inhabit stagnant waters.

Gen. 22. *Cercaria.*

Char.—Body of different shapes, furnished with a very simple tail.

The cercaria of Lamarck are more remarkable than the species of the former genus; as they have organs which might be mistaken for a mouth and eyes. There are eleven species, some of which inhabit animals and animal infusions, while others are found in stagnant waters or in sea water that has been long kept. They are generally sluggish in their motions, but sometimes vibrate the tail with great velocity.

Gen. 23. *Kerona.*

Char.—Body of different forms, without a tail, but furnished with a few filaments, or with horn-shaped hairs on some part of its surface.

There are about eight species, but they offer little remarkable except their forms. They are found in stagnant sea or fresh waters.

Gen. 24. *Trichoda.*

Char.—Body of different forms without a tail, but furnished with soft hairs, either throughout or on some part of its surface.

This is a numerous genus, containing about 47 distinct species, one of the most remarkable of which is that called by Muller *trichoda sol*, a small globular and crystalline body, everywhere beset with diverging rays, but generally found motionless.

Gen. 25. *Bursaria.*

Char.—Body very simple, membranous, and concave.

About five species have been distinguished, one of which is visible to the naked eye. They are found both in sea and stagnant fresh water.

Gen. 26. *Kolpoda.*

Char.—Body very simple, of a flattened oblong form, sinuate, and irregular.

Of the eleven species distinguished by Lamarck, one of the most remarkable is K. *cucullus*, found in most vegetable infusions, especially in water in which putrid hay has been steeped. It contains within the body numerous young ones; and when about to die from the evaporation of the fluid in which it lives, it bursts with violence and thus protrudes its offspring.

Gen. 27. *Paramecium.*

Char.—Body simple, membranous, and oblong. There are about five species, found chiefly in stagnant water, remarkable for their slow oscillatory motions, and for multiplying by division.

Gen. 28. *Cyclidium.*

Char.---Body very simple, flattened, round, or oval. Eight species have been distinguished, whose motions are sometimes vibrating, sometimes circular or semicircular, and quick or slow in the different species. Most of them are found in vegetable infusions, and some in putrid sea or fresh waters.

Gen. 29. *Gonium.*

Char.---Body very simple, flattened, short, and angular.

There are five species, remarkable chiefly for the great simplicity of their form, being almost all either triangular or quadrangular, and appearing like thin moving plates. Some of them are found in clear water.

Gen. 30. *Vibrio.* Microscopic Eel.

Char—Body very simple, long, and cylindrical.

Of this genus there are about ten species known; one of the most remarkable is V. *aceti*, or vinegar eel. It very much resembles the fish whose name it bears, and like it moves in the fluid with an undulating motion. It is supposed to change its skin, and is said to produce living young in summer, and lay eggs in autumn. It is one of the hardiest of the order, not being destroyed by moderate frost. It is often visible to the naked eye.

Gen. 31. *Proteus.*

Char.---Body very simple, changeable, so as in an instant to assume a different form.

There are two species, one of which, Pr. *diffluens*, or branching proteus, was ranked by Muller among the *trichoda*. It is found in stagnant fresh water, and especially where slime has been deposited from animal or vegetable matters. The natural form of its body is oblong or oval, without furrows or prominences; but it rapidly passes from this form to that of a lobated, sinuated body, and as speedily recovers its former figure.

Gen. 32. *Enchelis.*

Char.---Body very simple, oblong, or cylindrical, rather changeable.

Nine species are distinguished. They resemble the vibrios in form and the proteus in nature, and occur most commonly in putrid waters.

Gen. 33. *Volvox.*

Char.---Body very simple, spherical, or ovoid, turning on itself like a wheel on its axle.

Of eight species, one of the most remarkable is V. *globator*, represented at Fig. 10. of Plate 98.—It is spherical, and visible to the naked eye, and contains within the general covering numerous scattered globules, which appear to be its young, and have motions distinct from those of the parent, and generally more rapid. This species is seen in most stagnant waters.

Gen. 34. *Monas.*

Char.---Body a mere point.

The extreme simplicity and minuteness of the animalcules called *monads*, and the circumstance of their being found in almost all watery fluids that are undergoing fermentation or decomposition, have led some philosophers to doubt their animal nature, and to believe that they are merely the particles of the fluid set in motion by a chemical cause. It must be allowed, that if these moving points be animals, they exhibit the animal structure in its simplest form and most diminutive size; and as they are inferior to most vegetables in every property of life but motion, they appear to constitute the connecting link between organized and inorganic matter.

The scepticism respecting the vitality of these dancing atoms, has even been extended to animalcules in general, and has induced Lamarck to enter on an elaborate defence of the opinion that all these beings are really animals. His principal arguments are drawn from the incontestible facts of their irritability, their sudden and reiterated motions, and their self-multiplication; and he very ingeniously observes, that, admitting the animal nature of polypes which is universally allowed, the same nature can scarcely be denied to the *vorticellae*, and, as there is an evident gradation from them through all the infusorial animalcules, he infers that the same concession must be made in favour of them all.

Explanation of Plates.

Plate 97.

Fig. 1. *Sepia Officinalis*, Common Cuttle-Fish. In this front view, only seven of the shorter tentacula are seen, the eighth being concealed behind.—Fig. 2. *Clio Borealis*, Northern *Clio*.—Fig. 3. *Doris Verrucosa*.

Fig. 4. *Scyllæa Verrucosa*, Warty Scyllæa.—Fig. 5. *Ascidia Papillosa*, Papillary ascidia.—Fig. 6. *Amphitrite Volutacornis*.---Fig. 7. *Trichocephalus Hominis*, Human Trichocephalus, or Trichuris, natural size.---Fig. 8. The same magnified.---Fig. 9. A side view of the head, neck, and nearest joints of the common

Plates.

Tape-worm.---Fig. 10. A front view of the head and mouth magnified.—Fig.11. *Asterias Caput Medusæ*, Arborescent Sea-Star.---Fig. 12. *Holothuria Cuvieria*, Cuvier's Holothuria.---Fig. 13. *Actinia Coccinea*, Scarlet Animal-flower.

Plate 98.

Fig. 1. *Hydra viridis*, Common Fresh-water Polype magnified.—Fig. 2. *Vorticella Acinosa.*—Fig. 3. *Sertularia Halecina*, Herring-bone Sertularia,—Fig. 4. *Gorgonia Flabellum*, Sea-fan.—Fig. 5. *Corallium Rubrum*, Red Coral in its natural state.—Fig. 6. *Madrepora Cerebrum*, Brain-stone.—Fig. 7. *Renilla Vulgaris.*—Fig. 8. *Alcyonium Gorgonoides.*—Fig. 9. A variety of palmated Sponge, brought from the Orkney islands.—Fig. 10. *Volvox Glebator*.

INDEX.

A
Actinia genus - - 143
Alcyonium genus - - 147
Aldrovandi's marvellous relations 127
Amphinome genus - - 135
Amphitrite genus - - 134
Animalcules, microscopic account of 147
Annelides order - - 134
Aphrodita genus - - 135
Aplysia genus - - 133
Arenicola genus - - 135
Ascaris genus - - 138
Ascidia genus - - 134
Asterias genus - - 142

B
Biphora genus - - 133
Bursaria genus - - 149

C
Calmar described - - 131
Cercaria genus - - 148
Clio genus - - 132
Coral, organ, described - 145
    red, described - 146
Corallina genus - - ib.
Cuttle-fish, common, described 130
    gigantic, described - 131
Cuvier's arrangement of vermes 128
Cyclidium genus - 149

D
Doris genus - - 132

E
Earth-worm described - 136
Echinorynchus genus - 140
Echinus genus - - 141
Eel, microscopic account of - 149
Enchelis genus - - ib.

F
Fan, sea, described - - 146
Fasciola genus - - 140
Filaria genus - - 138
Flowers, animal, account of - 143
Fluke, of sheep, described - 140
Furcocerca genus - - 148
Furcularia genus - 145

G
Gonium genus - - 149
Gordius genus - - 157
Gorgonia genus - - 146
Guinea-worm, account of - 138

H
Hair-worm described - 137
Hare, sea, described - - 133
Helminthology, definition of - 127
    extent and utility of - ib.
    history of - ib.
    improvement of - 128
    imperfect state of - 129
    new arrangement in - ib.
Hirudo genus - - 136
Holothuria genus - - 142
Hydatids, account of - 140
Hydra genus - - 144

I
Infusoria, account of - 147
Intestina order - - 137
Isis genus - - - 146

K
Kerona genus - - 148
Kolpoda genus - - 149

L
Lamarck's arrangement of vermes 129
Leech, medicinal, account of - 136
Limax genus - - - 133
Linnæus's classifications of vermes 128
Lumbricus genus - - - 136

M
Madrepora genus - - 146
Medusa genus - - - 143
Millepora genus - - - 146
Mollusca described - - 129
    cephalopodous - - 130
    pteropodous - - 152
    gasteropodous - - ib.
    acephalous - - 133
Mouse, sea, described - - 135
Monas genus - - - 149

N
Nais genus - - - 136
Nereus genus - - 134
Nettle, sea, described - 145

P
Paramecium genus - - 149
Pen, sea, described - - 147
Pennatula genus - - ib.
Polype, fresh-water, account of - 144
Polypina, section of zoophytes - ib.
Proteus genus - - 149

R
Radiated zoophytes - - 141
Renilla genus - - 147
Royal Society, institution of favourable to Helminthology - 128

S
Scyllæa genus - - 132
Sepia genus - - 130
Sertularia genus - - - 146
Sipunculus genus - - 143
Slug, common, described - 133
Sponges, account of - - 147
Star, sea, described - - 142
Strongylus genus - - 139

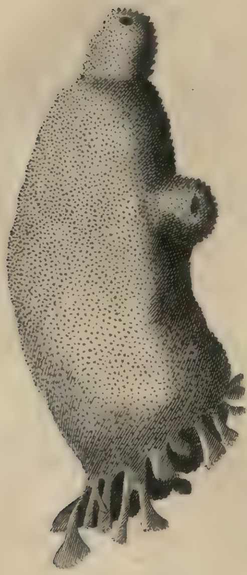
T
Tænia genus - - - 140
Tape-worm, account of - - ib.
Thalasema genus - - 136
Thread-worm described - - 139
Trichoda genus - - 139
Tube-worm described - - 143
Tubipora genus - - - 145

U
Vibrio genus - - 149
Vlovox genus - - - ib.
Vorticella genus - - - 145
Urchin, sea, described - - 141

W
Wheel animal described - 145
Worms, intestinal, account of - 137

Z
Zoophytes, account of - - 141

Fig. 5.



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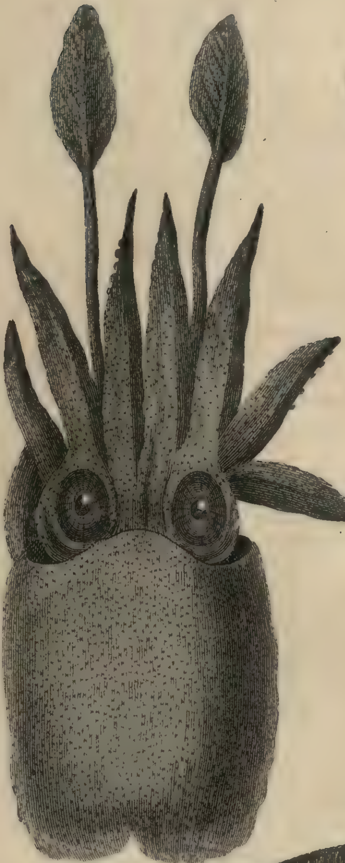

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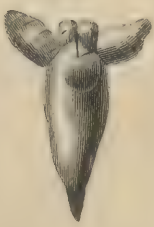

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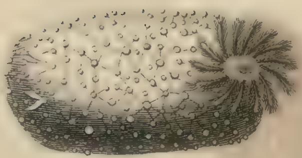

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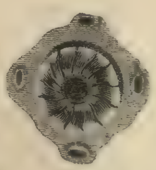

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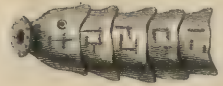

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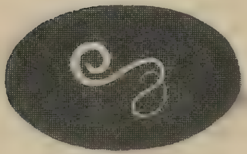

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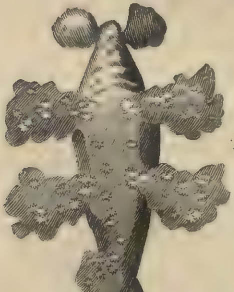

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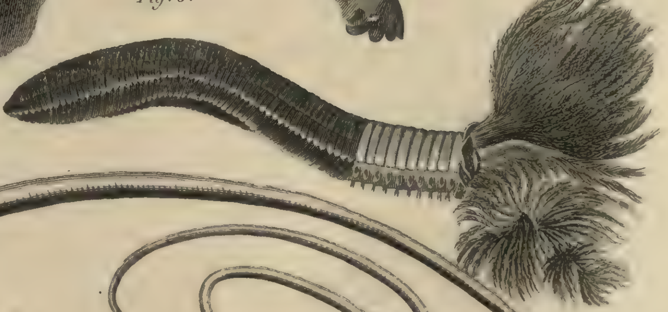

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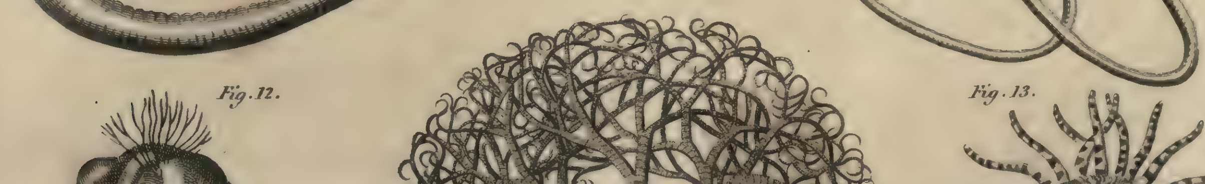

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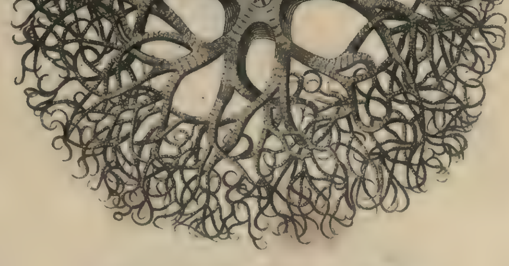

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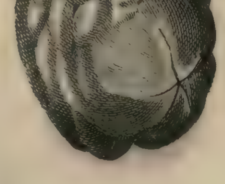

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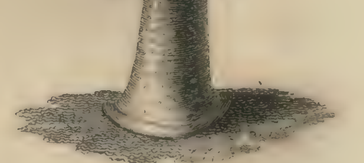

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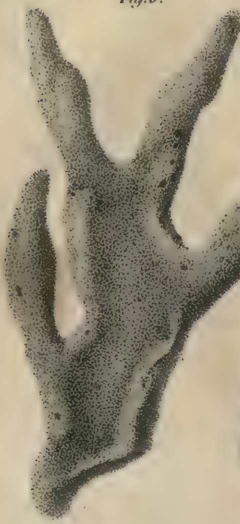
HELMINTHOLOGY. PLATE 98.

Fig. 9.



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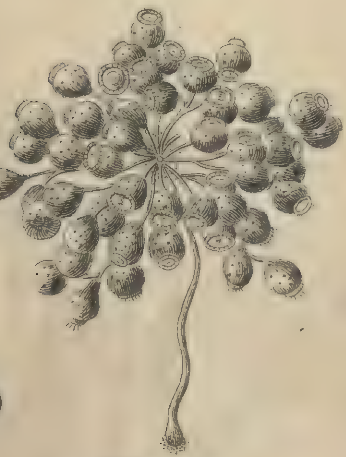

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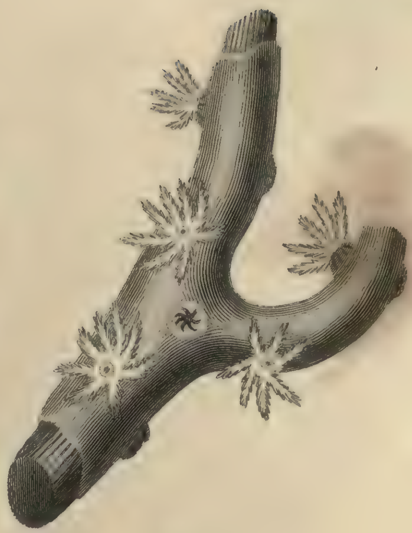

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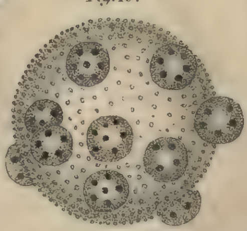

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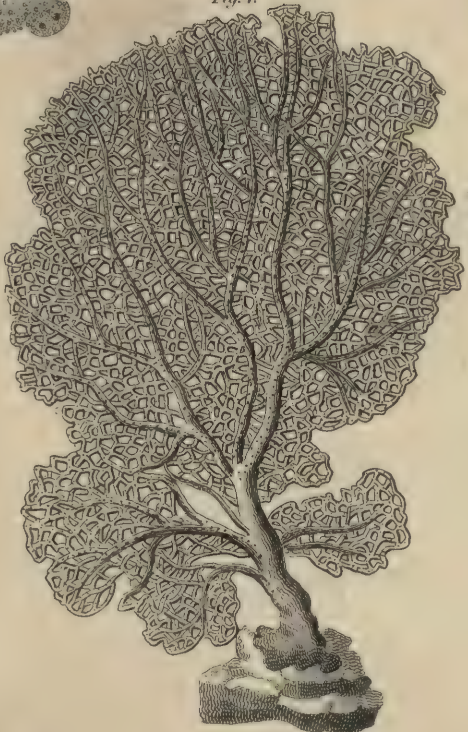

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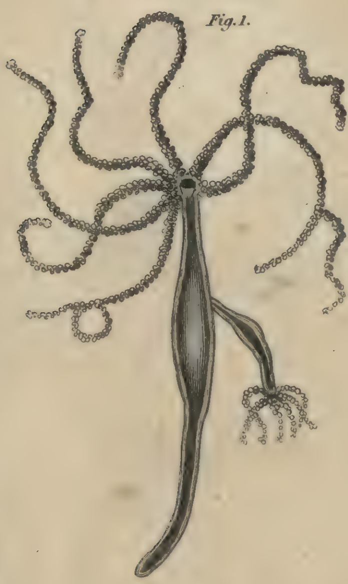

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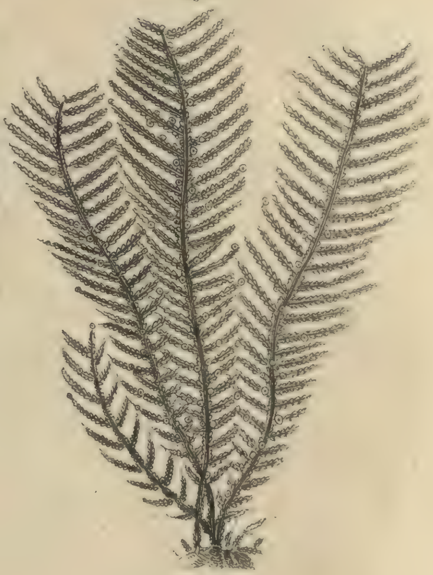

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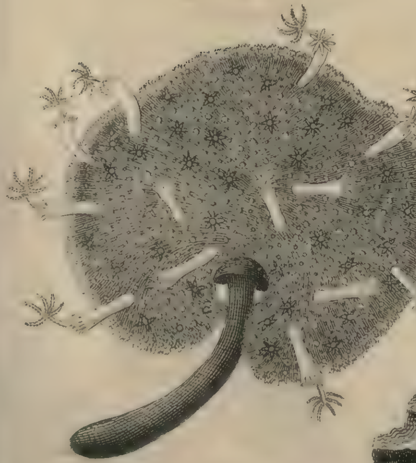

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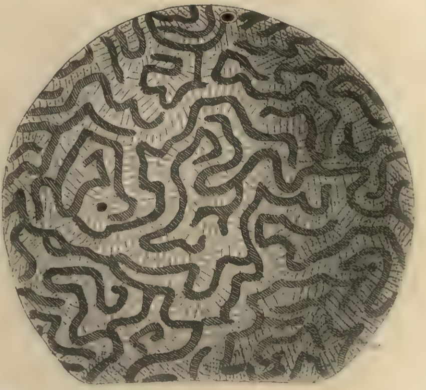

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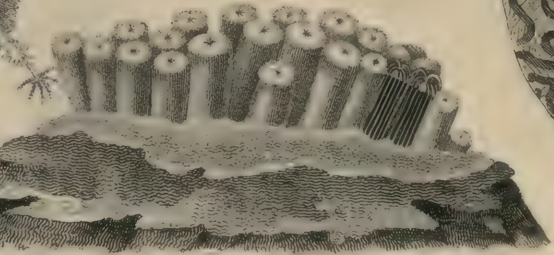

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HELMONT, John Baptist Van, a distinguished physician of the chemical school, was descended from a noble family, and was born at Brussels in 1577; studied physic at Louvain, and with great industry and zeal made himself master of the works of Hippocrates, Galen, and other ancient authors of the Greek and Arabian schools. In his seventeenth year he read lectures on surgery; and soon after rejecting the scholastic method of curing diseases, and entering on a rambling course of life, which he continued for ten years, he acquired some knowledge of chemistry, began the use of empyrical remedies, and with much zeal and enthusiasm practised medicine gratuitously. In all this, it is obvious, he was tinctured with the alchemical doctrines which still prevailed.

The first work of Van Helmont is a treatise on the Spa waters, published in 1624; and in this work he is the first author that notices the elastic fluid, or fixed air, which is given out by that mineral water. To this air he gave the name of *gas*, a term of familiar and general use in modern chemistry. He is also one of the first physiological writers that attended to the living principle, which he designated by the name *archæus*, and considered it as the superintendant or intelligent ruler of the animal frame, and analogous, as the medical reader will observe, to the *vis medicatrix naturæ*, or "healing power of nature," of more modern times. A collection of his works was published by his son in 1648; but although they are not destitute of acute remarks, and some curious speculations, they are rarely consulted for useful information.

HELONIAS, a genus of plants belonging to the Hexandria class.

HELOISE, whose name is associated with that of Abelard, on account of their romantic and unfortunate attachment, and whose story has been revived to the English reader in the impassioned verses of Pope, died abbess of the Paraclete in 1163. See Abelard.

HELOTS, were the slaves of the Spartans, a name derived from Helos, a maritime city of Laconia, which being taken by the Lacedemonians, the inhabitants were reduced to slavery, and hence the slaves of all nations afterwards received the same appellation. It was regarded as a degradation for a freeman of Sparta to engage in any menial office.

HELSTON, a town of Cornwall in England, contains more than 2000 inhabitants, was originally one of the stannary towns, and in the vicinity are still seen the remains of a castle and some religious houses.

HELVETIA, the ancient name of Switzerland, and hence the inhabitants were called *Helvetii*; and *Helvetic* body is still employed to denote the republic of Switzerland.

HELVETIUS, Claud-Adrian, a celebrated French metaphysician, was born at Paris in 1715, was educated at the college of Louis the Great, and soon distinguished himself by his genius and talents in that seminary. As he possessed a graceful figure and a genteel air, when he grew up he studied to recommend himself by excelling in polite accomplishments and manly exercises. But having accidentally seen M. de Maupertuis, who was remarkable for his singularity, his inclinations took a new direction, and he resolved to seek for distinction in profound study, and with this view he directed his first exertions to mathematics. By the rapid advances which he made in science and literature, joined with the wit and amiable manners that he possessed, he soon became a favourite associate with the most distinguished philosophers and men of letters of his time.

The first literary production of Helvetius was a didactic poetical composition, entitled "Epistles on Happiness," which was circulated amongst his friends, and received from them great applause. The publication and perusal of Montesquieu's "Spirit of Laws," it is said, suggested to Helvetius his work *De l' Esprit*, or Essays on the Mind and its several Faculties, which appeared in 1758. This work was condemned by the parliament of Paris, as being derogatory to the nature of man, and tending to destroy the distinctions between virtue and vice. But the proscription not only increased its circulation in France, but in other parts of Europe. Threatened with prosecution, the author found it prudent to withdraw for a time from his native country, and with this view he visited England and afterwards Prussia, where he was received with marked attention by the king, and lodged in his palace. His notions relative to the principles of morality and the nature of virtue, appeared to more sober inquirers to be calculated to produce unfavourable effects on superficial and unthinking readers; and while, with much force and wit, he exposes credulity in the absurdities of false religion, he disclaims the intention of offending against the sacred truths of Christianity, his sincerity may be more than suspected, for he often insinuates that the principles of religion are inadequate to the purposes of morality. The same principles are maintained and further extended in "A Treatise on Man, his Intellectual Faculties, and his Education," which was published after his death, as was also his poem on Happiness, the object of which is to shew that happiness depends on the cultivation of literature and the arts, rather than on the practice of virtue. He died in 1771, and left behind him a character conspicuous for disinterestedness, benevolence, and generosity. He resigned the lucrative situation of a farmer-general because its duties interfered with the course of his studies. He was kind and indulgent to his tenants and dependents, granted liberal pensions to literary characters, and even exercised his bounty on persons who were unworthy of it.

HELVOETSLUYS, a sea-port town of Holland, stands on the south side of the island of Voorn, and is the general port for the packets from England, and chiefly from Harwich. The harbour is spacious and capable of receiving any number of ships.

HÆMATITES, an ore of iron, which is so called because it gives a red streak, the colour of blood. See Geology.

HEMEROBIUS, a genus of insects belonging to the order *Neuroptera*. See Entomology.

HEMEROCALLIS, Day-lily, or Lily Asphodel, a genus of plants belonging to the Hexandria class.

HEMIMERIS, a genus of plants belonging to the Didynamia class.

HEMIONITIS, Mules Fern, a genus of plants belonging to the order of Filices, and class Cryptogamia.

HEMIPLEGIA, a medical term expressive of that kind of palsy in which one-half of the body is affected. See Medicine.

HEMIPTERA, signifying *half-winged*, denotes the second order of the class of insects in the Linnæan System. See Entomology.

HEMP, the fibrous part of the covering of the stems of *cannabis sativa*, which is extensively cultivated in Russia and other northern states, and imported into the southern regions of Europe for the purpose of being manufactured into sail-cloth and cordage. In a single year more than 58,000 tons have been imported from Russia to Great Britain and Ireland, the value of which has been estimated at more than £1,200,000 sterling. This statement shews the immense importance of this plant.

HENLEY, a town of Oxfordshire in England, stands on the banks of the Thames, contains more than 3000 inhabitants, and exports a great deal of corn, malt, and flour, for the supply of London.

HENRY, Matthew, an English nonconformist divine, and author of Expositions on the Bible, was a native of Flintshire, and was born in 1663, received the early part of his education under his father, who was also a dissenting clergyman, and studied for some time at an academy established at Islington. With the view of studying law as a profession, he entered himself at Gray's Inn; but still he continued the study of the Scriptures, and assiduously attended the sermons of Stillingfleet and Tillotson. In 1686, having qualified himself for the ministry, he began to preach; and in the succeeding year he was settled as pastor to a congregation of dissenters at Chester, and continued with exemplary zeal and success to discharge the duties of his office for 25 years, when he was removed to Hackney in the vicinity of London, where his clerical labours were still more extended. He died of apoplexy in 1714, while on his return from a visit to his old congregation in Cheshire.

The works published by Mr Henry furnish sufficient proof of his learning and knowledge. He was an elegant and pathetic preacher, and he was not less distinguished by the warmth of his piety and the amiableness of his manners. Beside his greatest work, "Expositions on the Bible," in 5 vols. folio, of which four contain the Old Testament, and the fifth the Evangelists and the Acts of the Apostles, part of the exposition of the Epistle to the Romans being finished by Dr Evans, he was the author of a discourse on Schism, A Biographical Sketch of his Father, A Scripture Catechism, Family Hymns, and several other religious tracts.

HENRY, Dr Robert, an English historian and Scottish divine, was a native of Stirlingshire, and was born in 1718, received the early part of his education at his native village St Ninians and at Stirling, and completed his studies at the university of Edinburgh. He was some time master of the grammar school at Annan; and being licensed to preach in 1746, he officiated for 12 years in a congregation of dissenters at Carlisle, from which in 1760 he removed to Berwick-upon-Tweed, to become pastor of a similar congregation; and in 1768, through the influence of a near relative, he was appointed one of the ministers of Edinburgh. He died in 1790, when he had reached the 73d year of his age; and it is worthy of notice, that he made a bequest of his library to the magistrates of Linlithgow, in the vicinity of which he had long resided during the summer season, to be the foundation of a public library for the use of the inhabitants.

The "History of England upon a New Plan," it is understood, began to occupy his thoughts about the year 1763, and his removal to Edinburgh gave him many facilities for its accomplishment. The first volume appeared in 1771, and it excited a great deal of ill-natured criticism from a party of his countrymen, who used every exertion to detract from its merits. But he steadily continued in the prosecution of his design; and four other volumes were published at successive intervals, the last in 1785. He had prepared for the press a sixth volume, which brings down the history to the reign of Henry VIII., and which was published in 1793, with the author's life prefixed. The different periods embraced by Dr Henry's history of Great Britain are arranged under seven heads: 1. The civil and military history; 2. The history of religion; 3. The history of our constitution, government, laws, and courts of justice; 4. The history of learning, learned men, and seminaries of learning; 5. The history of arts; 6. The history of commerce, shipping, money or coin, and of the price of commodities; 7. The history of manners, customs, language, dress, and amusements. This elaborate work, which may be regarded as an authentic repository of historical information, was at first but coldly received, and indeed met with some unjust criticism, part of which was excited by private malignity. But it is worthy of notice, that the actual emolument which he derived from the labour of thirty years on his history amounted to L.3300, beside an annual pension from government of L.100, which he enjoyed for ten years.

HEPAR SULPHURIS, or Liver of Sulphur, the old chemical term for the compound of alkali and sulphur, or sulphuret of an alkali. See Chemistry.

HEPATITIS, a disease of the liver. See Medicine.

HEPTANDRIA, the seventh class in the Linnæan system of plants, includes all those plants whose flowers have seven stamens. See Botany.

HEPTARCHY, a government consisting of seven persons, or a country ruled by seven persons, or divided into seven kingdoms, as in the case of the Saxon heptarchy, when England was divided into seven independent kingdoms.

HERACLEUM, Hog-weed, a genus of plants belonging to the Pentandria class.

HERACLIDÆ, the descendants of Hercules, were greatly celebrated in the ancient history of Greece, and acted a conspicuous part in all those changes and revolutions which took place in that country about the termination of its fabulous history. The recovery of the Peloponnesus by the descendants of Hercules, forms an important era in ancient history and is supposed to have happened 80 years after the Trojan war, or 1190 years before the Christian era.

HERACLITUS, a Greek philosopher, who flourished about the 69th Olympiad, and is said to have spent his life in bewailing the vices and follies of mankind. He is referred to as the author of a treatise upon Nature; and the fundamental doctrine of his philosophy was, that fire is the principle of all things; but no part of his works is now extant.

HERALD, derived from a Saxon word, signifying a champion, is a person who is employed to denounce war, to challenge to battle and combat, to proclaim peace, and to execute martial messages. The origin of heralds is traced to the remotest periods of antiquity. They were known to the Greeks, and are alluded to by Homer; a college of heralds was established among the Romans, and to them it belonged to decide on the justice or injustice of a war; and among modern nations similar institutions exist.

HERALDRY.

HERALDRY, or **BLAZONRY**, strictly speaking denotes the art of drawing or explaining coats of arms, considered as ensigns of honour and marks of parentage; and is also frequently used to signify that art or science which has for its objects the discrimination and adjustment of ranks, the marshalling of processions and cavalcades, and the appointing and arranging of ceremonies on public occasions. Taken in this comprehensive sense, it is evidently of material importance in a civilized community; but even in its more trivial acceptation, it offers some excitement to rational curiosity; and, besides ministering to an excusable if not a laudable vanity, it may prove an useful ally to history, by pointing out the achievements and the characteristics of former times.

Few subjects have been more perplexed than this art by multiplicity of authorities and discordant theories,---the natural consequence of its varied origin, the number of materials of which it consists, and the different purposes to which it has been applied in different countries and at different periods. Its elements may, nevertheless, be pretty readily ascertained; and such a knowledge of it as is requisite for agreeably perusing some of the older authors in the languages of Europe, or for determining the more obvious and essential distinctions of ennobled and remarkable families, may be communicated in a short compass.

CHAP. I. OF ARMORIAL BEARINGS.

Coats of arms, or, in the heraldic sense, simply *arms*, are marks of honour, commonly hereditary, consisting of certain figures and colours arranged in a particular manner, and originally worn as decorations of dress and armour, on military and some other occasions, in order to distinguish the bearers. They were usually granted, by sovereign princes and remarkable personages, in acknowledgment and as a reward of meritorious services; and, by being handed down from generation to generation, have contributed, in many cases more effectually than either family names or paternal properties, to particularize the descendants of illustrious characters. They form a very appropriate feature of chivalrous times and the feudal system. They are found, accordingly, in every country in Europe where the order of knighthood was established; and some traces of them may be discovered in almost every region where the military art has been elevated into a distinct and a reputable profession.

But though it is to the profession now named, characterized, as it necessarily is, by the employment of peculiar instruments, and dignified, as it generally has been, by sundry privileges, that we ought to look for the origin of heraldry, yet it has happened, in course of time, that many individuals have borne armorial ensigns who never were engaged in the military art; and it is equally certain that many of the ensigns themselves are derived from events and circumstances which were no way connected with the pursuits of war. The truth of this remark will be proved, in the course of those explanations respecting the different kinds and portions of arms into which it will be necessary to enter in this sketch.

The practice of tournaments, so prevalent and so impressive in former times, afforded the choicest reasons, and the fittest opportunities, for the art of heraldry. These entertainments admitted, at least as performers, only those persons who were of the higher ranks of society, and whose native courage, aided by suitable discipline, which was rather of a costly kind, and the possession of certain expensive habiliments, gave them a right to hazard danger for the sake of glory. It was usual for monarchs and their courts to attend these trials of dexterity and strength; and, besides the varied elegance then exhibited, to the display of which the presence of such eminent personages served as a powerful incitement, it was necessary to discriminate the candidates for fame by specific badges, generally worn on dress. These were usually so contrived as to bear allusion to personal qualifications and enterprises, or to the acquirements of ennobled ancestry. Even the passion of love lent its agency, and that a very intense one, to these exhibitions of valour and address, by stimulating the combatants in their feats of rivalry, which were frequently undertaken in order to testify peculiar regard for, or to solicit favour from an admired object; and while it thus sanctioned the office of the herald, it also furnished some of the materials of his art, by imparting to the martial garb the softer expressions of friendship or affection. Ladies are often represented, in the romances and chronicles of the "olden times," as leading their heroes to the lists by a silk band, or a chain of silver; and, still more frequently, as animating or rewarding the knights with ribbands, wreaths, scarfs, and other ornamental appen-

Armorial Bearings.

dages. All of these badges, though at first appropriated to specific purposes, became at length of permanent value, as indicative of meritorious daring or successful achievement, and as such were employed to enhance the respectability of the wearer at subsequent tournaments, during public ceremonies, or on the field of battle.

Sect. I. *Of Kinds of Arms.*

The expression *armorial bearings*, as may be affirmed of a great variety of other terms used in this art, evidently points out the connexion which there is every reason for believing originally existed between such insignia and the concerns of war. The same relation is unequivocally manifested by the manner in which these badges were worn. They were attached, for example, to the shield, to the helmet, to the banner or flag, of the bearer; and they sometimes surmounted the body-armour in the form of a coat, which was often very splendid; whence the expression "coat of arms," used to denote them.

But as the reasons for the use of armorial bearings extend, as already mentioned, beyond the affairs of a soldier, several denominations of arms are occasionally met with which cannot be explained within the limited sphere of his art. The chief of them may be thus enumerated and defined.

1. *Arms of dominion*, signifying those marks or badges of sovereignty which are generally borne by the chiefs or representatives of independent states and kingdoms, as expressive of their real or supposed authority.

2. *Arms of pretension*, employed by monarchs or kingdoms claiming certain dominions as their own in whole or in part, though actually possessed by others.

3. *Arms of concession*, by which are understood certain honourable insignia granted in recompence of extraordinary services.

4. *Arms of community*, those which belong to certain corporate bodies, or conjoined persons, as the recognised token of their union.

5. *Arms of patronage*, the badges of certain individuals or bodies, in the capacity of managers or patrons of peculiar interests.

6. *Arms of family*, styled also *paternal arms*, which serve to distinguish the heirs and members of the same genealogical stock.

7. *Arms of alliance*, used to designate the additions which have been made to families by matrimonial unions.

8. *Arms of succession*, significant of inheritance or acquest of estates, whether derived from voluntary donation or legal reversion.

9. *Arms of assumption*, such as are taken up without any title, behest, property, or achievement, that can warrant the vanity and conceit of the wearer.

Sect. II. *Of Fields.*

Generally speaking, all armorial insignia may be classed under one of these heads, on whatever object, or in whatever way they are exhibited. For this purpose different means have been adopted in different countries and at different periods of the art; though usually, for reasons already assigned, the military profession has afforded the basis on which they are borne. Thus, the surcoat, coat of arms, or tabard, may be considered as a sort of cloak or mantle which was thrown over the armour, and which, by being curiously marked, designated the wearer. Its origin is conceived to have been the skin of a wild beast, which probably formed the primitive garb of many people, and which was often decorated with spots, stripes, and chequers, for the sake of distinction. The robes of heralds themselves, those worn by peers and some remarkable office-bearers, may be readily traced to this cause, which seems to have operated extensively among the northern nations of Europe.

Ensigns or banners, too, which, it is almost needless to say, were of very various dimensions, forms, and colours, appear to have been frequently employed to sustain armorial insignia, as must be known to every reader of history. These ensigns were sometimes placed on the turrets of castles or other military eminences, and, still more generally, were carried on the field of battle, as the respective emblems and rallying points of the hostile adventurers. Flags and pennons, of which the variety is great, are extensively used, as is well known, for the display of national insignia. See Plate 102.

Helmets, crowned or decorated with wreaths, plumes, scarfs, and other appendages, were also significant symbols recognized on like occasions. Even the spurs and the stirrups of warriors, as well as the furniture of their horses, were not unusually impressed with characteristic differences, which were thought of value in the field of honour.

But it is the shield which has been of most extensive utility in heraldry, and which consequently merits most notice in treating of the elements of the art.

The basis, whatever it may be, surcoat, banner, helmet, or shield, on which armorial bearings are placed, is, in the language of heraldry, denominated the *field*, in contradistinction to the symbolical figures delineated on it, which are styled *bearings* or *charges*. Before treating of it particularly in the form last mentioned, or noticing the figures which it bears, it is proper to enumerate and describe the different colours employed in the art.

Sect. III. *Of Tinctures.*

These are of two classes, the first denominated *metal*, from the circumstance of their being furnished by certain metals; and the second simply called *colours*. The words commonly used to denote those of both kinds are chiefly either of Oriental or French extraction. They are as follows:

Or . that is .	Yellow or gold	Metals.
Argent . .	White or silver	
Azure . . .	Blue.	Colours.
Gules . . .	Red.	
Sable . . .	Black.	
Vert or sinople .	Green	
Purpure . . .	Purple.	

These are the tinctures regularly and principally employed; but certain writers make mention of two

Armorial Bearings.

more, which are rarely to be met with in armorial bearings, viz.

Tenny	Orange.
Sanguine	Blood colour.

These are stated to imply what is called an *abatement of honour,* that is, a degradation; and on that very account, it may be safely affirmed, they are not often blazoned.

A particular mode of expressing the tinctures, without using any colouring substance, has been invented, and is found highly convenient in heraldic engravings. It therefore demands attention.

Or, is signified by dots or small points.

Argent	a blank surface.
Azure	horizontal lines.
Gules	perpendicular lines.
Sable	perpendicular and horizontal lines crossing each other, or forming hatches.
Vert,	diagonal lines running downwards from the right hand towards the left.
Purpure	diagonal lines running downwards from the left hand towards the right.
Tenny	diagonal lines like those of purpure, traversed by horizontal lines.
Sanguine	diagonal lines like those of vert, traversed by horizontal lines.

Colours retained from natural or artificial objects, and not referrible to those heraldic tinctures, are called *proper.* Such are the colours of animals, plants, shells, instruments, &c. which are of frequent occurrence in armorial bearings.

Besides the colours now mentioned, certain furs have long been used in the art, and are by some writers classed with the tinctures. They are:

Ermine and vair. The former, which is supposed to be taken from an animal of the same name, is white spotted with black. The latter is chequered, or consists of small pieces, shaped somewhat like bells, which are white and blue alternately, whence the term *vair* or *varied.* Several modifications of these furs are sometimes met with, and may be briefly specified.

Counter-ermine, or *ermines*, is where the field is sable and the spots are white.

Erminoise, where the field is or, and the spots are sable.

Erminites, field argent, the spots sable, with a red train on each side.

Pean, field sable, spots or.

Counter-vair, where the bells, which are of the same colour, are placed base against base, or point against point.

Grand-vair, where the rows of the bells are only three in number.

Menu-vair, when the rows are above four.

Vairy-cuppy, or *potent-counter-potent*, signifying a field filled with certain marks resembling crutches, or the tops of gallows (*potence*) counter-placed.

The use of the tinctures seems to be derived from the several colours adopted in the dresses worn by warriors during their services in the field, or by the combatants at jousts; and these were generally so arranged as to give the appearance of contrast. Heralds, adhering to this peculiarity, have established a rule which prohibits tinctures of the same class from being placed upon each other. Thus, those called *metal* are never put on *metal*, nor colours on colours; but metals are put on colours, and *vice versa.*

The Shield.

CHAP. II. OF THE SHIELD.

The shield, or escutcheon in heraldry, as in the military art among the ancients, is of various forms; but of these the most common, and that which is best adapted to the display of armorial honours, is somewhat of a triangular shape, or rather resembles the vulgar delineation of a heart. A description of its points or compartments, and its lines of partition, is absolutely necessary to the elements of blazonry.

SECT. I. *Of the Points of the Shield.*

It has been found convenient to divide the shield into various parts, which are destined for the reception of peculiar symbolical figures. This is easily effected. Thus suppose a shield of the shape already mentioned, Plate 99; it is divided by heralds into nine parts or points, here designated by the first nine letters of the alphabet.

The part marked A B C, at the top of the shield, is called the *chief*, or in the French language, which has been so much used in the art, *chef*: that marked D, from its corresponding with the collar, where it was usual to suspend badges of honour, is termed the *collar* or *honour-point*; that where the letter E is placed is variously styled the *cœur-point*, the *centre*, or *fess-point*; that marked F is the *nombril* or *navel-point*; the parts G and H are termed by the French the *flanque-points*, but by English writers the *base-points*; and the part marked I is the *base-point*. Or, supposing the three letters G H I, all to stand in the same horizontal line, H being in the middle, and the six preceding letters to remain as represented; then A is styled the *dexter chief point* or *canton*, B the *middle chief point*, C the *sinister chief point*, D E and F as above, G the *dexter base point*, H the *middle base point*, and I the *sinister base point.*

These distinctions ought to be well understood and remembered, for reasons which will shortly appear; and the reader will remark, from their enumeration, that the dexter or right side of the shield is that which is opposite to his left hand, and the sinister or left side that which is opposite to his right hand, or, in other words, that the shield is conceived to be placed so as to front him. This is the invariable practice in heraldic drawings and descriptions.

SECT. II. *Of the Lines used in the Partition of Shields.*

When a shield has a certain tincture diffused over the whole of its surface, it is not divided; and the tincture, whether metal, colour, or fur, is said to predominate. But when a shield has more tinctures than one, as is frequently the case, then it is divided by lines which have various forms and names. The chief of these require to be mentioned. They may be either straight or crooked.

A shield divided into two equal parts by a horizontal line, is said to be *coupé* or *parted per fess:* if

The Shield.

by a perpendicular line, it is *parted*, or *party per pale*; if by a straight line passing diagonally from the dexter chief point to the sinister base point, it is called *tranché*, or *party per bend dexter*: if by a diagonal drawn from the sinister chief point to the dexter base point, it is styled *taillé*, or *party per band sinister*. A shield divided into three equal parts by two straight lines, is said to be *tierce*, and that may be in four different ways; as, if by horizontal lines, it is *tierce per fess*; if by perpendicular lines, it is *tierce per pale*; if by diagonals from right to left, it is *tierce per bend dexter*; and if by diagonals from left to right, it is *tierce per bend sinister*.

The combinations of horizontal, perpendicular, and diagonal lines, are as follows: When the two former meet so as to cut each other at right angles in the centre of the shield, or, in the language of heraldry, when the lines denominated *parted per fess*, and *parted per pale*, or simply *coupé* and *parti*, meet, they divide it into *quarters*; when *parted per bend dexter*, or *tranché*, and *parted per bend sinister* or *taillé*, meet, the shield is said to be divided or parted *per saltier*; when *coupé, taillé*, and *tranché* meet, or *coupé, parti, taillé*, and *tranché*, the shield is said to be *gironed*, or *girony*; in the former case, *girony of six*, in the later *girony of eight*. But, besides these straight lines, heraldry admits a great variety of crooked ones, which, whenever they occur, require to be particularly expressed in speaking of armorial bearings. Thus, they are called *engrailed*; *invecked* or *invected*; *wavey* or *undē*; *battled, embattled*, or *crenellē*; *nebule*; *regule* or *raguly*; *indented*; *dancettē*; *pattē* or *dovetailed*; *embattled, aronde*; *battled embattled*; *champaine*, *&c. &c.* See Pl. 99.

What are called *repartition lines*, are those which cut the shield into unequal parts.

The use of these, and several other lines, which it is unnecessary to particularize, is to give place for different bearings, as by the division of the field they admit more arms than those of one family to be expressed. Thus, each of the portions into which the shield is thus divided, may serve as the field in which the arms of allied families are placed. There are even examples of many more divisions, as into 12, 16, 20, 32, 64, &c. parts. In such cases, which are no doubt rare, and rather fantastic, the shield is said to exhibit a *genealogical achievement*. It is not unusual to have only two arms, though the shield be divided into four parts. In this case the first and fourth quarters are alike, as allotted to one of the bearings; as are also the second and third, as allotted to the other. When a shield is divided into quarters, and one or more of these is also quartered, the term *counter-quartering* is applied to the division. Each of these again may be counter-quartered, and thus it is easy to reach the number of divisions above mentioned.

The consideration of the lines of partition in shields, naturally leads us to the heraldic figures placed on them, under the name of ordinaries.

Sect. III. *Of Ordinaries.*

These are made up of some of the lines which have been now enumerated, and are applied to shields as ornamental distinctions. They have been styled "honourable ordinaries," not because they are more honourable than any of the other figures which are borne on shields, but because they have been generally or *ordinarily* employed to form insignia of honour in armorial bearings. They have also been divided into ordinaries and sub-ordinaries; but, for this practice, though sanctioned by several writers, there appears to be no real occasion. Their number has been variously estimated from eight to upwards of twenty. The following list comprehends the principal of them; most of which, it may be worthy to remark, seem to be derived from combinations of stripes or lines used in imitation of the *cross*, at one time esteemed the great exemplar and source of honour.

The Shield.

1. A single stripe, placed horizontally across the upper part of the shield, so as to cut off a third part of it, is denominated a *chief*.

2. A single stripe, equal in breadth to the third part of the shield, running perpendicularly through the centre of the shield from the chief to the base, is termed a *pale*.

3. A *fess* is a single stripe, placed horizontally across the middle of the shield, and generally, though not always, equal to a third part of its breadth.

4. A *bend*, or *bend-dexter*, is a single stripe, placed diagonally from right to left of the shield, and in breadth commonly either a third or a fifth part of it.

5. A diagonal stripe, running from left to right, constitutes the *bend-sinister*.

6. A *bar* is a single stripe going horizontally across the centre of the shield in the same manner as the *fess*, but containing only a fifth part of the breadth of the shield.

7. A *cheveron* is composed of two diagonal stripes, one of which runs in the direction of the *bend-dexter*, and the other in that of the *bend-sinister*, from the sides of the base of the shield, till they meet in the centre. It resembles, therefore, the letter V inverted thus Λ, or the rafters of a house; and it occupies either the third or the fifth part of the shield.

8. A *cross* consists of two stripes, one perpendicular and the other horizontal, like the *pale* and the *fess*, which are incorporated at the centre of the shield, not laid one upon the other; or it may be said to be made up of a fourfold line, two parts of which are perpendicular and two horizontal, and which meet in the centre of the shield.

9. A *saltier*, or *sautoir*, is composed of two stripes, one of them a *bend-dexter*, the other a *bend-sinister*, incorporated at the centre; or consists of four lines, two drawn from the dexter-chief to the sinister-base, and two from the sinister-chief to the dexter-base, which meet in the centre of the shield, and are equal in breadth to either a third or a fifth-part of the shield.

10. A *quarter*, or *franc quarter*, is the upper dexter quarter of a shield. It is determined by imaginary lines drawn in the manner of a cross, so as to divide the shield into four portions, the first or highest on the right of which constitutes this ordinary.

11. A *canton* is of the same form and in the same position as the preceding, but occupies only a third part of the chief.

12. A *giron* will be readily understood, from what was before said on the lines of partition, to be a tri-

angular or conical figure, determined by two lines drawn from different parts of the shield, and meeting in an angle at the *fess-point*. When a shield is divided by the cross and saltier, eight girons are produced; and many more may be made of smaller size by the multiplication of similarly crossing lines. One *giron*, or several *girons*, may be used in a shield. In the latter case they are represented of at least two tinctures used alternately.

13. A *pile* bears some resemblance to a *giron*, but has two of its sides equal, which this has not, and generally issues from the chief, where it is broadest, proceeding towards the base, where it terminates in an angle; but there are examples of its having a different position. More than one *pile* are sometimes found in a shield.

14. A *pairle* is a sort of cross formed by the union of the upper part of a saltier with the under part of a pale, and therefore bears a resemblance to the letter Y.

15. A *lozenge* is a four-sided figure, having one of its angles pointing upwards. Several *lozenges* may be placed in the same shield, in which case they are of two tinctures, used alternately.

16. A *mascle* resembles a *lozenge*, but is perforated so as to leave a narrow border.

17. A *fret* consists of six pieces, two composing a *saltier* and the other four a *mascle*, over which latter the former are interlaced; or it may be described as a square frame, having one of its angles laid upon a *saltier*. If two pales are represented as placed transversely on the frame, a sort of lattice is produced, which is termed *fretty*.

18. A *border*, as its name imports, is an annulet, or a ring going round the edges of the shield.

19. An *orle* may be considered as an inner *border*, because, though it goes round the shield, so as to copy its shape, it does not touch its edges.

20. A *tressure* is a narrower orle, and is sometimes borne double.

21. A *flanch* resembles a segment of a large circle issuing from the corner of the chief, and swelling till it reach the *nombril* point of the shield, when it diminishes towards the *sinister base* point.

22. What are termed *flasques* and *voiders* are nearly of the same nature as the *flanch*, though generally smaller, especially the former.

23. An *escutcheon* is a small shield borne within the shield, either singly on the *fess* point, when it is called *escutcheon of pretence*, or in different numbers and of different sizes.

24. A *billet* is an oblong rectangular figure, somewhat resembling a brick or a folded letter, whence probably its name.

Several of these ordinaries have diminutives, which are also used as ordinaries. Thus,

To the *chief* belongs the *fillet*, which does not exceed a fourth of it, and stands in the lowest part.

The *pale* has two diminutives,—the *pallet*, which is about the half of it; and the *endorse* or *verget*, which is one-half of the *pallet*.

The *bend-dexter* has, for its diminutives, the *bendlet*, the *garter*, and the *cottise*; and the *bend-sinister* has the *scarf* and the *batton*.

The diminutives of the *bar* are the *closet* and the *barrulet*.

The *cheveron* has for diminutives the *chevronel* and the *couple-close*.

The proportions which these diminutives bear to their principals vary from one-half to a sixth part.

The lines which determine the ordinaries may be either straight or modified, according to some of the varieties formerly mentioned, in which case the specific denomination of the boundary ought to be given.

Sect. IV. *Of Charges.*

When the shield, or any of the ordinaries drawn on it, bears the representation of some object, whether natural or artificial, it is said to be *charged*, and the figures thus borne are termed *charges*. They are extremely numerous, as indeed they are taken from every kingdom of nature and every department of art. The reason of this may be easily understood.

Originally, there is ground to believe, coats of arms were very simple. Ostentation and vanity, keeping pace with the increasing number of candidates for fame, were obliged to have recourse to a wide compass of objects, in order to find suitable marks of distinction. In addition to these fruitful sources of variety, it necessarily happened that particular enterprises furnished appropriate materials for honourable insignia. Those connected with the crusades, for instance, were astonishingly productive of heraldic badges,—among which, of course, the cross, in every diversity of its form, bore a most significant part. In one way or other it was displayed by every Christian army that engaged in this devout but injudicious undertaking; and its different colours and other peculiarities served to point out the respective assemblages of fanatic warriors. But, besides the cross, every object that in any remarkable degree, or even incidentally, characterized the progress of this mighty enthusiasm, served to designate those individuals who were in any measure rendered conspicuous in it; and the influence of the church, which gave such fervour to the combatants, was hardly more wonderful than the ingenuity which could contrive sufficient insignia to discriminate and gratify them.

It is conceived to be utterly useless, even were it practicable in any moderate compass, to enumerate all the figures which have been used at one period or other, or are still adopted as heraldic charges. But a classification of the principal of them, with occasional remarks, may not seem either superfluous or uninteresting to the general reader.

1. Charges may be the figures, real or supposed, of natural objects. We find, accordingly, in armorial bearings, the representations of the celestial bodies; of human beings, or parts of them; of the lower animals in all their diversities; of individuals in the vegetable world; of certain mineral substances which have regular appearances, and are conceived to possess remarkable properties.

To the figures taken from this class, a great many epithets are applied to indicate their attitudes, posi-

The Shield.

tions, and respective actions. Thus, the sun when in *or* is said to be *proper*; if in one of the *colours*, it is styled *ombre de soleil*, and has the colour specified in addition to this designation: The moon may be *in her complement*, that is, when full; or the half moon may be *crescent*, *increscent*, or *decrescent*: the stars, or *mullets*, as they are often called, may be of five or more points. The parts of the human body, if seemingly clean cut off, are said to be *couped*; if torn away from their connections, to be *erased*. Wild beasts, as for instance lions, which are of common occurrence in heraldic honours, are called *rampant*, when they are placed standing in an erect position in profile; *rampant guardant*, if with their faces in front; *regardant* if looking behind them, which they may be either *passant* or *rampant*; if in the attitude of springing forwards, they are *saliant*; *sejant* if sitting; *couchant* if lying; if proceeding from the lower part of the ordinary where they are borne, they are *issuant*. Farther, an animal is said to be *debruised* or *depressed*, when an ordinary passes over him, in which cases the name of the ordinary gives an epithet to the depression; if given on a shield that is cheveroned, it is called *countercharged*; if its claws or tongue be cut off, it is styled *disarmed*, and if its head, feet, or tail be wanting, it is *dismembered*. Birds may be *volant*, *preying*, *expanded*, *elevated*, *crested*, &c. Fishes, too, are variously denominated from their mode of representation, as *naiant*, *hauriant*, &c. Trees and plants are, for a similar reason, styled *eradicated*, *trunked*, *fructuated*, &c.

2. Charges may be figures of artificial objects, as of warlike instruments; of the ornaments used on occasions of state and public ceremonies; of the various arts and manufactures. Here, too, various terms are employed to specify the particular mode in which the figures are delineated. Thus swords may be *erect*, *hilted*, *crossed*; and arrows or spears *pointed*, *in base*, or *in chief*; gauntlets may be *left-handed* or *right-handed*; coronets may be *ducal*, *royal*, &c.; turrets may be *embattled*; columns *entire*, *broken*, &c. &c.

3. Charges are also often the figures of chimerical or imaginary beings, as of angels, heathen deities, compound animals, and animals with supposed virtues,—to all of which, as in the former cases, several expressions are applied to characterize their specific habits.

Under the title of charges may be comprehended certain figures invented by heralds to answer several purposes, not provided for by any of the three preceding classes. They differ, of course, according to the use to which they are destined, and have obtained various generic names, which have induced some writers to rank them elsewhere than under charges, though decidedly, as will be seen, of a similar nature. The first we shall mention are intended to denote distinctions in the members of the same family, and have been consequently styled,

4. Marks of cadency, or differences of houses.—These are a *label*, which points out the heir or first son; a *crescent*, used to distinguish the second son; a *mullet*, or star, the third; a *martlet*, a bird, the fourth; an *annulet*, the fifth; a *fleur-de-lis*, the sixth; a *rose*, the seventh; a *cross moline* the eighth; a *double quatre-foil*, the ninth. Of these marks of cadency it is proper to remark, that they are but indifferently fitted for their alleged use, as, besides tending to confuse a shield, they are necessarily so small as hardly to be recognised, unless the heraldic drawing be of great dimensions. They are rather of modern invention, and are, notwithstanding, probably for the reasons now mentioned, getting somewhat into desuetude. Ancient heralds chose generally to characterize the different members of a family by modifications of the *border*, peculiarities in the adjustment of the charges, and alterations in the tinctures, all or any of which deserve more attention than the modern differences now enumerated.

The Shield.

The next class of subsidiary changes is of still less frequent occurrence, from the very circumstance of the characters which they indicate, but is usually described in heraldic works. It is that of,

5. Abatements of honour; certain figures, or modifications of figures, intended to denote some degrading quality or disreputable action in the bearer or his ancestors. They are nine in number; a *delf tenné*, applied to the arms of one who had receded from a challenge; a *reversed shield sanguine*, in the centre of the armorial shield, designing the person unfaithful to his prince or dishonourable to a female; a *point dexter parted tenné*, for one who has been noted for idle boasting; a *point in point sanguine*, significant of a coward; a *point champaine tenné*, for one who killed his prisoner after quarter had been requested; a *plain point sanguine*, to characterize a liar; a *gore sinister tenné*, one who has conducted himself ungenerously or dishonourably towards an enemy; a *gusset sanguine* on the dexter side of the shield, one who has been guilty of adultery,—and the same mark on the sinister side for a drunkard; the *shield reversed*, to brand a traitor. To which it may be proper to add certain figures used as marks of illegitimacy. The most common of these are a *baton-sinister*, that is, a rod or staff placed diagonally, with its upper end pointing to the left corner of the shield; and a border, striped across, of any two colours, surrounding the shield.

6. Charges indicative of additions of honour, sometimes also mentioned by writers on heraldry, are in reality almost any of the ordinaries which have been taken in addition to former bearings. Those most preferred to designate new acquisitions of glory are, the *quarter*, *canton*, *border*, *gyron*, *pile*, *flasque*, *flanche*, *voider*, and *escutcheon*.

7. Lastly, under the head of charges may be comprehended several figures of a miscellaneous kind, and used for various purposes, but which are not exactly referrible to any of the preceding classes. Of this sort are *guttes* or *drops*, which obtain different names according to the different substances supposed to be indicated by them,—as *guttes d'or*, drops of gold; *guttes d' eau*, drops of water; *guttes d' olive*, drops of olive oil; *guttes des larmes*, tears; *guttes de poix*, drops of pitch; *guttes de sang*, drops of blood. These are sometimes borne alone, but more frequently are sprinkled on a shield. *Bezants* are supposed, with every probability, to signify pieces of money struck at Constantinople, anciently called Byzantium, and to have had their origin in the ran-

Concomitants of the shield.

Concomitants of the shield.

som occasionally paid for vanquished knights or other unfortunate individuals during the crusades. Though they are chiefly of gold, they are sometimes represented of all colours. *Plates* are conceived to be of a similar nature, but to be of silver. *Ogresses* or *pellets* resemble bullets used in fire-arms. *Torteauxes* seem to be the cakes often denominated *wastals* in old English authors. *Golpes* are thought to signify wounds. *Guzes* are imagined to represent eye-balls. The term *papilloné* is applied to a shield when covered with figures like fish scales; and a shield is said to be *diaspré* or *diaperé*, when it is shadowed with flourishing and turnings "by *purfels* of gold or silver, or tinctured after the fashion of flowers, like the weaver's diaper napery."

CHAP. III. OF THE CONCOMITANTS OF THE SHIELD.

Such figures alone as are placed within the shield are essential to a coat of arms; and, for a long time, there is reason to believe, were the only displays which the heraldic art had to regard. But as the number of those persons who wore arms increased, so as to bear a considerable proportion to the community, by which the distinctions of rank were likely to be confounded, it was thought necessary by the nobility, and other eminent individuals, to adopt some methods for indicating their superiority, whether this consisted in high birth, in dignity of office, or illustrious achievements. Hence the introduction of a great variety of ornamental additions to the shield, all intending to bear some reference, more or less exact, to the peculiarities of dress or costume which characterized the possessors, on the greater occasions of state and public ceremonies. A coat of arms, then, with its complete assemblage of exterior ornaments, may be conceived to be a representation of an individual according to the place which he really holds in society. Of the coat of arms itself, or the shield as it is usually denominated, we have already spoken at sufficient length, and with sufficient minuteness of detail for the purposes of most readers. We have now to treat of those subsidiary contrivances which have been adopted to give it a discriminative power in the matter of rank and personal consequence. We shall enumerate and describe them in the order of the ingenious and erudite Mr Brydson, to whose "Summary View of Heraldry" we confidently refer the more inquisitive reader.

The concomitant ornaments of a coat of arms are either ordinary or extraordinary, and to these must be added those badges of dignity which are usually borne on the outside of a shield. We divide this chapter, therefore, into three parts.

SECT. I. *Of Ordinary Concomitant Ornaments.*

These are the helmet, mantlings, wreath, crest, and motto, of which in order.

A *helmet*, which was anciently worn as a part of military dress, in order to defend the head during battle, forms a very natural addition to a coat of arms. It is represented of various materials and forms, and in different positions; but much of the nicety which has been introduced into heraldic works, when treating of its diversities, is to be ascribed rather to fancy than to any urgent necessity. The following particulars may be thought worthy of notice.

The helmets of sovereign princes are of burnished gold damasked; those of princes and the higher orders of nobility are of silver figured with gold; and those of knights and inferior gentry are of steel. So much as to their materials, which nevertheless vary somewhat in different countries where appropriated peculiarities are attempted to be established. As to form, the helmets of sovereign princes and the higher nobility are generally placed fronting, and are distinguished by the number of their bars. Thus the royal helmet of England has six bars, three on each side of the open space in the middle; whereas that of dukes and marquisses has one bar in the middle and two bars on each side of it. A helmet with four bars is common to peers under the rank of a marquis. A helmet without bars is often used by baronets and knights. Gentlemen or esquires have their helmets in profile, and they are close. These distinctions are frequently departed from, and others are adopted which it is not worth while to specify.

The proper position of the helmet is immediately above the shield.

Mantlings appear to be representations of those hoods or coverings which were occasionally employed to screen helmets from the injuries of the weather. But though this may be properly considered their origin, it is certain that their form has undergone great alteration since the time of their adoption; and that in their present state they have a better claim to be denominated flourishings than mantlings. They are usually marked as ornamental foliages proceeding from each side of the helmet; and this peculiarity has been traced, perhaps fancifully enough, to the tattered condition in which the coverings of the helmets were frequently found after returning from military service. As these coverings were originally of various materials, so we meet with corresponding differences in the appearance of mantlings, which are sometimes of fur and sometimes seemingly of cloth or silk. Several of the remarks now made may be applied to the *mantle*, or cloak, which is frequently placed behind the shield in armorial bearings. And here too it may be noticed, that those who bear arms have also certain distinguishing colours worn in the dresses of their servants. These are styled *liveries*, and are often the principal tinctures of the heraldic insignia. The origin of the term, as well as of the custom, is imagined to be those splendid habits which were *delivered* by kings to their households on particular festivals.

The *wreath* is a sort of roll formed by silk cords twisted together, which went round the head, and served to fasten the mantlings to the helmet. The colours of the wreath are usually those of the principal tinctures in the shield.

The *crest* is a representation of some figure, whether natural or artificial, placed above the helmet, and forming the highest part of the ornaments of a coat of arms. From its position, it was necessarily the most conspicuous singularity in the military costume of ancient times; but its use in heraldry is, com-

Concomitants of the shield.

paratively speaking, modern. When first introduced as an honourable appendage, it seems to have been restricted to sovereign princes and commanders. Afterwards it was adopted by inferior personages, and now scarcely any individual, who chuses or thinks himself entitled to wear armorial insignia, neglects this peculiarity, though he be not of the military profession. *Properly* speaking, crests are hereditary no less than other heraldic distinctions; but as they have been usually considered as devices, and as the members of the same family have frequently taken different crests from those of their ancestors, and from one another, it has happened that caprice and vanity have occasioned endless varieties of them. Nothing is more common in our days, than for persons who do not otherwise bear arms to exercise their inventions in forming crests, as well as mottos, for seals and other trinkets, without any guide or authority but their own humours and imaginations.

The *motto* is a word or short sentence written in a scroll, either over the crest, and in allusion to it, or in some other part of the bearing. Mottos are sometimes the reliques of the *cry of war*, which served as the rallying shout to certain families in critical times; others are derived from something memorable and characteristic in the history of a house; and many, as above hinted, are the contrivances of persons who have nothing else to consult than their own singularities of pretension and fancy. Mottos, therefore, like crests, are either hereditary, appropriate, or arbitrary.

SECT. II. *Of Extraordinary Concomitant Ornaments.*

These are chiefly two, the compartment, and the supporters.

The *compartment* is a figure occasionally used as the basis on which the shield is supported. Many heralds consider it as a representation of the lands belonging to the bearer, which is probably the truth in many cases; but, in others, it seems rather to be emblematical of some enterprise or remarkable occurrence in the history of an individual. In the former instance it is usually a kind of scroll, sometimes containing a motto, and may be denominated a territorial compartment; in the latter it is more frequently the figure of some animal, or other natural object, which is in reality a symbolical cognizance.

Supporters are figures of various kinds placed on each side of the shield, as if to support or hold it up, whence their name. Their origin has been traced by some writers to the practice adopted at tournaments, of having pages or other attendants attired in singular or gorgeous dresses, often the skins of beasts, to stand by the shields of knight, as if to guard them before the lists were opened; but by others is referred to the fancy of seal-engravers, who chose to fill up their work with something complimentary to their employers. The frequent changes of supporters, which are known to have been made in former times seem to confirm the second opinion; but, on the other hand, the circumstance of supporters being considered so importantly honourable as to be specially granted by royal authority, would argue a greater value in them than could be derived from the fancy of the artists. The judgment of Sir George Mackenzie on this topic in his work on the art, is not a little curious. "The first origin and use of them was from the custom which ever was, and is, of leading such as are invested with any great honour to the prince who confers it: Thus when any man is created a duke, &c. he is supported by and led to the prince betwixt two of the quality, and so receives from him the symbols of that honour; and, in remembrance of that solemnity, his arms are thereafter supported by any two creatures he chuses." Admitting this opinion, it will be easy to understand how those persons only who were ennobled were permitted to wear supporters; and how, upon any new accession of honour, the supporters were varied. But it may be difficult to discover any reason, which does not imply much want of courtesy in the bearer, for his representing those personages who introduced him to majesty by some of the creatures often employed as heraldic supporters. On the whole, the first opinion is considered to be the most probable one. It is maintained by Mr Brydson, who adds some circumstances in proof gathered out of different authors. Thus, after referring to Menestrier, who suggests this origin, he remarks:—"It became a custom at great festivals to exhibit, between the courses, different animals bearing about their necks shields of arms of those whom it was intended particularly to compliment. In the order of the Star, Favine describes a magnificent entertainment given by the prince of Navarre, at Tours, when he was made a knight and affianced to the daughter of Charles VII. One of the exhibitions was a ship in which stood a peacock bearing about his neck the arms of the queen; while the flags and streamers exhibited those of the ladies of the court. Another was a huge tiger disgorging flames of fire from his mouth and nostrils, and having round his neck a collar or chain, from which was suspended the arms of the king. This custom seems to have occasioned so many supporters to be represented with chains and collars."

Concomitants of the shield.

The right to have supporters is restricted to certain limits in England and Scotland. Thus, in the former, it is confined to the higher orders of nobility, knights of the Garter and the Bath, and such other knights as the king pleases to compliment with the honour; and, in the latter, it is possessed by the heads or chiefs of clans, by baronets, and in reality by all who can shew proof that their ancestors bore these honours previous to an act passed in the reign of Charles II. prohibiting grants of supporters to persons under the rank of nobility. No females, except those who are peeresses in their own right, wear supporters. Of late years, it may be remarked, the restrictions now mentioned have been frequently violated; and, through the vanity of aspiring individuals, and negligence on the part of official persons, an extension of the use of supporters has taken place which threatens inextricable confusion to heraldry.

SECT. III. *Badges of Dignity.*

The armorial insignia which betoken superior honours are chiefly helmets, collars, swords, batons, maces, banners, hats, mitres, coronets, and crowns, to which may be added the pavilion. In place of

Concomitants of the shield.

treating of these individually and minutely, it will be more satisfactory to consider them in relation to the distinctions which they are employed to illustrate.

1. The various orders of knighthood have been denoted by specific badges. Thus, one order used for its device a crescent, another a star, a third a sword, and several adopted certain modifications of the cross. Every order, besides, has its peculiar collar.

Members of the different orders of knighthood commonly surround their shields with the collars of their orders; and, generally, the collar of the most ancient order is placed nearest the shield, in the arms of an individual who is a member of more than one order. This usage seems to have originated in the practice of wearing a golden chain, or a riband of some particular colour, and having an appropriate device, round the neck on occasions of ceremony. Knights of every order commonly bear an open helmet over their arms.

2. Baronetage, considered as an order of hereditary nobility, has some heraldic distinctions. Those persons in Great Britain who enjoy it by right of patent under the great seal of the United Kingdom, bear within their shield the figure of a red hand. Those who hold it under the great seal of Scotland wear an orange riband, appended to which is a medallion bearing the device of their dignity, St Andrew's cross, with the arms of Scotland, under an imperial crown; and these insignia are also marked round their coats of arms. Baronets, like knights, bear an open helmet over their arms.

3. Dignified officers are either military, civil, or ecclesiastical; and each of these is occasionally indicated by armorial badges.

Swords, battons, and banners are the most common insignia of military offices, and are sometimes, accordingly, placed as exterior ornaments of shields. For example, the earl marshal of England bears behind his shield *two battons in saltier, sable, the ends gold.*

Civil offices of dignity have been designated by various badges appropriate to their specific nature. Thus, the lord high treasurer of Scotland was accustomed to bear behind his shield *a white staff or rod ensigned on the top, with an imperial crown in pale*; and the hereditary office of royal cup-bearer in the same kingdom was denoted by a *golden cup*, borne in the arms of the Southesk family.

Among the insignia of ecclesiastical offices may be mentioned the mitre, proceeding from a plain circle of gold on the top of the shield, to denote the dignity of bishop in the church of England; and a mitre proceeding from a ducal coronet, with two labels hanging from it, also two crossiers in saltier behind the shield, that of an archbishop. The numerous dignitaries of the Romish church have all their peculiar insignia. Those of the Pope are the tiara or triple crown, the keys, and staves; and the red hat with fifteen tassels is the well known symbol of a cardinal.

4. The badges of the higher nobles and royal personages are chiefly modifications of coronets and crowns, worn immediately above the top of the shield.

The *crowns* of independent sovereigns in Europe are usually circles of gold arched at the top and variously ornamented with jewels, and having a cap within, which is of velvet turned up with ermine.

Marshalling, &c.

English dukes have a circle of gold, with eight leaves, supposed to be of the strawberry, of equal height, rising above the rim, the whole being richly chased, and enclosing a crimson velvet cap.

A marquis's coronet is a circle of gold with four leaves placed between as many pearls, which are raised up on points so as to be of the same height with the leaves.

An earl's coronet has eight pearls on as many points, and strawberry leaves between these points lower down.

A viscount has twelve or sixteen pearls placed on the edge of the golden circle.

A baron has only six pearls in the same position.

The eldest sons of peers above the degree of a baron have their father's arms and supporters with a label, and use the coronet appropriate to the father's second title. Younger sons of the same bear the same arms with marks of cadency, but do not use coronets.

Many of the princes and nobility of Germany were accustomed to bear a number of helmets over their arms, having a crest on each, according to the principal arms within the shield, and the number of fiefs by which they were entitled to vote in the circles of the empire.

A *cap of state*, consisting of crimson velvet, faced with ermine, and having two points turned to the back, was in former times frequently worn on the helmet as a mark of dignity, by princes and dukes, both in England and Scotland. But, in modern times, it has been assumed by persons who, if properly examined, would not be found entitled to any armorial insignia whatever.

The *pavilion* is a tent with a canopied roof, comprehending and surmounting the whole arms, hitherto adopted only by some sovereign princes. Mr Nisbet, in his large and erudite work on Heraldry, exemplifies it in the case of the royal arms of Scotland.

CHAP. IV. OF MARSHALLING OF ARMS, AND THE LAWS OF HERALDRY.

Heraldry, like every other art, has several rules or prescriptive regulations, which are acknowledged as authoritative by those who practise it. They respect two particulars, and may consequently be considered under two heads.

SECT. I. *Of Marshalling of Arms.*

By this term is understood the art of disposing of diverse ensigns of honour in a shield, in cases where there is an union of two or more families. The chief rules for this relate to the kinds of union intended to be shewn, and are the following.

Where the arms of two distinct families united by marriage are given on a shield, which is called *arms en baron et femme*, they may be placed in three ways, 1. By dividing the two shields, entitled to be worn by the parties, so as to join the dexter half of the husband's arms to the sinister half of the wife's, and

Marshalling, &c.

thus form one shield; 2. By placing the half of the husband's arms palewise with the full coat of the wife; and, 3. By placing palewise the full coats of the parties so as to form them into one shield conjoined in the middle. The last mode cannot well be adopted where either of the arms has a border, because this must stop where the shields meet.

It is a general rule, that the husband's arms occupy the dexter side of a shield and the wife's the sinister. It is proper that the marks of cadency, if any, which are worn by the father of the wife be inserted in her arms.

In the case of the wife being an heiress, the mode of impaling the conjoined arms varies somewhat in Scotland and England. In the former country, it is very usual for the husband to quarter his wife's coat with his own, by dividing the shield into four equal parts by *coupé* and *parti*,—the first and fourth quarter containing his own arms, and the second and third those of his wife. But, in England, the more common way is to place the wife's arms on an escutcheon in the centre of his coat, thus forming what has been called an *escutcheon of pretence*.

The higher dignitaries of the church of England impale their arms, so as to give the dexter side to the arms of their diginities, and indicate their symbolical union with them.

Armorial insignia granted by sovereigns in testimony of honourable services may be marshalled several ways, and are so in foreign countries, though comparatively seldom in Scotland,---as by *tranchie* and *taille-lines*, exemplified in the arms of Sicily; by surmounting shields with escutcheons, a mode denominated *surletout*, as in the old arms of the Orange family; by charging the ordinaries with escutcheons, as in the case of the noble family of St Clair, earl of Caithness; by *tiercing* and *engrafting*, as in the case of the king of Great Britain; and by dividing the shield into many areas by *parti* and *coupé* lines, as in the arms of queen Mary of Lorraine impaled with those of James V. of Scotland.

SECT. II. *Rules for Blazoning.*

The more common materials of heraldry having been thus enumerated and explained, it is proper to state the mode of procedure to be adopted in describing them, or, in other words, to give the technical rules of blazonry.

1. The *field* ought to be mentioned. In doing so, state, in the first place, if it be divided by lines, and say what these lines are, as *parted per-pale*, &c. Then mention the tincture or tinctures, as *argent, azure*, &c.

2. Proceed to the ordinaries, simply naming them if plain, or specifying their form if defined by crooked lines; and then mention their tincture.

3. Enumerate the charges, commencing with those which lie nearest to the shield, and advancing to those which are farthest off. They are to be definitively expressed, and have their tinctures named.

4. In speaking of the tinctures, when more than one occur in a shield, and several ordinaries or charges are comprehended, it is usual to avoid repetition of terms by the employment of the words, *of the first*, or *second*, &c. or *of the field*, or *of the same*, &c. in order to denote the same tincture.

Illustrations.

5. When one ordinary or other figure is placed over another, let it be named after that on which it is placed, using the term *surtout*, or *over-all*.

6. A principal figure or bearing simply named, without its place on the shield being mentioned, is understood to occupy the middle of the shield.

7. When natural objects are mentioned, it is customary to add the term *proper* to them, if they are represented of their own specific colour; but if they are not, then their heraldic tincture ought to be mentioned.

8. If three or more figures of the same kind occur in a shield, their number must be stated; and they are to be arranged according to their number in particular ways, denominated the *different dispositions of figures*. These are best learned from examining heraldic drawings in which they occur.

CHAP. V. ILLUSTRATIONS OF SYMBOLICAL HERALDRY.

The reader will now, it is hoped, find himself quite able to enter upon the consideration of armorial insignia, as they are presented on the seals, the carriages, and other appendages of members of ancient and ennobled families. But as he may require some help in his first practical efforts, it is proposed to detail for his use some of the most remarkable of the heraldic bearings of the English and Scottish nobility. These may prove interesting, independent of their subserviency to the art, by referring to those events and circumstances which gave rise to the symbolical representations.

DUKES.

HOWARD, hereditary Earl Marshal of England, Duke of Norfolk, bears arms---four grand quarters; 1. for Howard, gules, on a bend between six cross croslets, fitchy, argent; an augmentation in remembrance of services in the battle of Flodden-field, that is, on an escutheon, or, a demi-lion, pierced through the mouth with an arrow, within a double tressure, flory counter-flory, gules: 2. for Thomas of Brotherton Earl of Norfolk, gules, three lions passant-guardant, in pale, or, a label of three points in chief, argent: 3. for Warren Earls of Surrey, checky, or and azure: and 4. for Mowbray, Dukes of Norfolk, gules, a lion rampant, argent. In right of his office he bears behind the shield two marshals staves in saltier, or, enamelled at each end, sable, having the royal arms at the upper end, and his own at the lower.

He has two crests, the original one---a chapeau, gules, turned up ermine, a lion statant-guardant, or, the tail extended, gorged with a ducal coronet, argent; and another as Earl of Arundel, on a wreath, a mount, vert, surmounted by a horse, passant, argent, holding in his mouth a slip of oak, fructed proper.

Supporters.—On the dexter side a lion, and on the sinister a horse, both argent.

Motto.—*Sola virtus invicta.*

SEYMOUR, Duke of Somerset, bears a shield, quarterly; 1st and 4th, or, on a pile, gules, between six fleurs-de-lis, azure, three lions, (an augmentation by Henry VIII. on his marrying Lady Jane Seymour)

2d and 3d, the paternal coat of Seymour, gules, two wings conjoined in lure, their tips downwards, or.

Crest.—Out of a ducal coronet, or, a phœnix in flames, proper, with expanded wings, or; but originally it was, on a wreath, a pair of wings as above, and crowned, or.

Supporters.—On the dexter side an unicorn, argent, maned or, gorged with a ducal collar, azure, having a chain affixed, or; and sinister, a bull, azure, maned, collared, chained, and hoofed as that on the dexter.

Motto.—*Foy pour devoir.*

Lennox, Duke of Richmond. Quarterly; 1st and 4th, the arms of France and England, quarterly; 2d, arms of Scotland; and 3d, those of Ireland; the whole within a border compone, argent and gules, the first charged with verdoy of roses of the second, and seeded proper; over all, an escutcheon bearing the arms of Aubigny, gules, three oval buckles, or.

Crest.—On a chapeau, gules turned up ermine, a lion statant-guardant, or, crowned with a ducal coronet, gules, gorged with a collar gobone, charged as the border.

Supporters.—Dexter, an unicorn, argent, armed, crested, and hoofed, or; sinister, an antelope, argent, armed, &c. as the dexter. Both gorged as the crest.

Motto.—*En la rose je fleurie.*

Fitzroy, Duke of Grafton, a descendant of Charles II, bears the arms of that monarch, with a baton sinister, compone, argent and azure.

Crest.—On a chapeau, gules turned up ermine, a lion statant-guardant, or, crowned with a ducal coronet, azure.

Supporters.---Dexter, a lion guardant, or; sinister, a greyhound, argent.

Motto.---*Et decus et pretium recti.*

Somerset, Duke of Beaufort, descended from an illegitimate branch of the Plantagenets, bears quarterly France and England, within a border compone, argent and azure: originally the same arms, or, on a fess bordered gobone, argent and azure.

Crest.—A portcullis, or, nailed, azure, in remembrance of John of Gaunt's castle of Beaufort: but formerly, a panther, argent.

Supporters.—Dexter, a panther, argent: sinister, a wyvern, vert.

Motto.—*Mutare vel timere sperno.*

Beauclerk, Duke of St. Albans, a descendant of Charles II., bears the arms of that king, with a baton, sinister, gules, charged with three roses, argent, seeded and barbed, proper.

Crest.—On a chapeau, &c. a lion statant-guardant, or.

Supporters.—Dexter, an antilope, argent; sinister, a greyhound, argent.

Motto.---*Auspicium melioris ævi.*

Osborne, Duke of Leeds. Quarterly, ermine and azure, a cross, or.

Crest.---On a wreath of his colours, a tyger passant, argent.

Supporters.---Dexter, a griphon, or; sinister, a tyger passant, argent.

Motto.---*Pax in bello.*

Russel, Duke of Bedford. Argent, a lion rampant, gules; on a chief, sable, three escalops of the first.

Crest.---A goat, passant, argent, armed, or.

Sup.---Dext. a lion; sin. an antelope, both gules.

Mot.---*Che sara sara.*

Cavendish, Duke of Devonshire. Quarterly; 1. for Cavendish, sable, three hart's heads, caboshed, argent, attired, or; 2. for Boyle, per bend, embattled, argent and gu.; 3. for Clifford, checky, or and az. a fess gu.; 4th as 1st.

Cr.---A snake, nouè, proper. This is used by the family, but in the engraving in Collins's peerage, edited by Sir E. Brydges, it is a stag.

Sup.---Dext. and sin. a hart, proper.

Mot.---*Cavendo tutus.*

Spencer, Duke of Marlborough. Quarterly; 1st and 4th quarterly, argent and gules; in the 2d and 3d a fret, or; over all, on a bend, sable, three escalops of the first; this is for Spencer; 2d and 3d sable, a lion rampant, argent; on a canton of the last, a cross, gules, for Churchill.

Cr.—A gryphon's head between two wings, erect, argent.

Sup.—Dext. a gryphon, argent; sin. a wyvern, argent.

Mot.---*Dieu defend le droit.*

Manners, Duke of Rutland. Or, two bars, az. a chief, quarterly, of the second, and gu.; the first and fourth charged with two fleurs-de-lis of the first, and the second and third with a lion passant-guardant, of the same. The chief was formerly gu.; and the charge is an augmentation, denoting descent from Edward IV.

Cr.---A peacock in pride, proper.

Sup.---Two unicorns, argent.

Mot.---*Pour y parvenir.*

Hamilton, Duke of Brandon. Four grand quarters—first grand quarter, quarterly, first and fourth gu.; three cinqfoils, pierced, ermine, being for Hamilton; second and third argent, a ship with furled sails, sable, as Earl of Arran: second grand quarter, argent, a human heart, crowned, proper, and on a chief az. three mullets, arg. for Douglas; third and fourth grand quarters as the second and first respectively.

Cr.--- An oak fructed proper, having a saw fixed in its trunk.

Sup.---Two antelopes, arg.

Mot.---*Through.*

Bentinck, Duke of Portland. Azure, a cross moline, argt.

Cr.---Out of a marquis's coronet, proper, two arms, counter-embowed, and vested, gu., gloved, or, and holding each an ostrich feather, arg.

Sup.---Two lions, the dexter or, the sinister sable.

Mot.---*Craignez honte.*

Montagu, Duke of Manchester. Quarterly; first and fourth, arg.; three lozenges conjoined in fess, gu. within a border, sable, with a crescent as a difference, for Montagu; second and third, or, an eagle displayed, vert, beaked and membered gu., for Monthermer.

Cr.---A gryphon's head coupé, or, wings indorsed, sab. gorged with a collar, arg. charged with three lozenges, gu.

Sup.--Dext. an antelope, or; sinister, a gryphon, or.

Illustrations.

Mot.—*Disponendo me, non mutando me.*

Sackville, Duke of Dorset. Quarterly, or and gu., a bend dexter, vaire.

Cr.—Out of a coronet, adorned with fleurs-de-lis, or, a star of twelve points, arg.

Sup.—Two leopards, arg., spotted sab.

Mot.—*Aut nunquam tentes aut perfice.*

Pelham Clinton, Duke of Newcastle. Argent, six crosslets, fitchy, sab. on a chief az.; two mullets, round pierced, or.

Cr.—In a ducal coronet, five ostrich feathers, proper, banded azure.

Sup.—Two greyhounds, arg.

Mot.—*Loyalte na honte.*

Percy, Duke of Northumberland. Quarterly; 1st and 4th grand quarters, quarterly; 1st and 4th, or, a lion rampant, az., the bearing of the ancient dukes of Brabant; and 2d and 3d, gu., three lucies or pykes, for Lucy: 2d and 3d grand quarters, az.; five fusils in fess, or, for Percy.

Cr.—On a chap. gu., a lion passant, az.

Sup.—Dext. a lion, az.; sin. an unicorn, argent. But one authority gives sin. a lion.

Mot—*Esperance en Dieu.*

Wellesley, Duke of Wellington. Quarterly; 1st and 4th gu. a cross arg. between four saltiers of plates, for Wellesley; 2d and 3d, or, a lion rampant, gu. gorged with a ducal coronet, proper, for Colley. With additions, and a millet for difference.

Sup.—On either side a lion, gu., gorged with an eastern coronet, and chain reflexed over the back, or.

Mot.—*Virtutis fortuna comes.*

Marquisses.

Paulet or Powlet, Marquis of Winchester. Sab. three swords in pile, pointing to the base, arg., their pomels and hilts or.

Cr.—A falcon rising, or.

Sup.—Two hinds, purp.

Mot.—*Aymez loyaulté.*

Grenville Temple, Marquis of Buckingham. Vert, on a cross, arg., five torteaux, for Grenville.

Cr.—On a wreath a garb, vert.

Sup.—Dext. a lion, party per fess, embattled, or, and gu.; sin. a horse, argent, powdered with eaglets, sab.

Mot.—*Templa quam dilecta.*

Petty, Marquis of Lansdowne. Quarterly, 1st and 4th, ermine, on a bend, dexter, az., a magnetic needle pointing at a polar star, or, for Petty; 2d and 3d arg. a saltier, gu. and chief, erm., with a crescent for a difference.

Cr.—A bee-hive with bees, volant, proper; likewise a centaur with his bow and arrow.

Sup.—Dext. a pegasus; sin. a gryphon.

Mot.—*Virtute non verbis.*

Gower, Marquis of Stafford. Quarterly; 1st and 4th, barry of eight, arg. and gu.; over all, a cross, flory, sab., for Gower; 2d and 3d az., three laurel leaves erect, or, for Leveson.

Cr.—A wolf passant, argent.

Sup.—Two wolves, arg.

Mot.—*Frangas non flectes.*

Townshend, M. of Townshend, has right to bear very numerous insignia; but those of the name are, Az. a chevron, ermine, between three escallop shells, arg.; and those of Thomas Plantagenet, sirnamed of Woodstock, duke of Gloucester, sixth son of Edward III. of whom he is direct lineal heir, are, Sab. a lion of England, between three helmets, proper.

Illustrations.

Cr.—A buck, sab.; also a swan, arg. holding an ostrich feather; also an unicorn, passant, ermine; also a peacock's tail, proper.

Sup.—Dext. a buck, sab.; sin. a greyhound, arg.

Mot.—*Hæc generi incrementa fides.*

Cecil, M. of Salisbury. Barry of ten, arg. and az.; over all, six escutcheons disposed 3, 2, 1, sab. each charged with a lion, rampant, of the field, a crescent for mark of cadency.

Cr.---Six arrows interlaced, or, their heads and feathers, arg. bound by a belt, az.

Sup.---Two lions, erm.

Mot.---*Sero, sed serio.*

Thynne, M. of Bath. Barry of ten, or and sab. according to one authority; but by another, quarterly; 1st and 4th as above, 2d and 3d, a lion, gu.

Cr.—A rein-deer, or.

Sup.—Dext. a rein-deer, or; sin. a lion, gu.

Mot.—*J'ay bonne cause.*

Hamilton, M. of Abercorn. Gu. three cinquefoils pierced, ermine: but entitled to other bearings.

Cr.—As the duke of Hamilton.

Sup.—Two antelopes, arg.

Mot.—*Sola nobilitas virtus.*

Cornwallis, M. Cornwallis. Sab. gutty d'eau, on a fess, arg. three Cornish choughs, proper, for Cornwallis.

Cr.--A mount, vert, and on it a stag, regardant, arg.

Sup.—Two stags, arg.

Mot. *Virtus vincit invidiam.*

Conway Seymour, M. of Hertford. Quarterly; 1st and 4th, sab. on a bend, dexter, cotised, arg., a rose between two annulets, gu. for Conway; 2d and 3d grand quarters, quarterly, 1st and 4th, or, on a pile, gu., between six fleurs-de-lis, az., three lions passant-guardant, or, (a coat of augmentation;) 2d and 3d gu., two wings conjoined in lure, or, for Seymour.

Cr.—The bust of a moor, side-faced, couped, proper, wreathed about the temples, arg. and az.

Sup. Two moors, wreathed as above, each holding a shield, az.

Mot.—*Fide et amore.*

Stuart, M. of Bute. Or, a fess, checky, arg. and az. within a double tressure, flory and counter-flory, gu.

Cr.—A demi-lion, gu. and over it in a scroll, "Nobilis est ira leonis.'

Sup.—Dext. a horse, arg.; sin. a stag, proper.

Mot.---*Avito viret honore.*

Cecil, M. of Exeter. Same as M. of Salisbury, but without the crescent, for difference.

Cr.—A garb, or, supported by two lions; the dext. arg. the sin. az.

Sup.—Two lions, ermine.

Mot.---*Cor unum, via una.*

Earls.

Talbot, Earl of Shrewsbury. Gu. a lion rampant, within a border, engrailed, or.

Cr.---A lion statant, or.

Sup.---Two talbots, arg.

Mot.---*Prest d'accomplir.*

Stanley, E. of Derby. Arg. on a bend, dext. az. three bucks heads, or.

Cr.—An eagle, or.

Sup.---Dext. a gryphon, or.; sin. a buck, or.

Mot.---*Sans changer.*

Herbert, E. of Pembroke. Party per pale, az. and gu.; three lions ramp. arg.

Cr.—A wyvern, vert.

Sup.—Dext. A panther, arg.; sin. a lion, arg.

Mot.—*Ung je serviray.*

Fielding, E. of Denbigh. Arg. on a fess, az. three lozenges, or.

Cr.—A nut-hatch with a hazel branch, proper.

Sup.—Two bucks, proper.

Mot.—*Crescit sub pondere virtus.*

Fane, E. of Westmoreland. Az. three right hand gauntlets, or.

Cr.—A bull's head, arg.

Sup.—Dext. a gryphon, arg.; sin. a bull, arg.

Mot.—*Ne vile Fano.*

Grey. E. of Stamford. Barry of six, arg. and az.

Cr.—An unicorn erect, erm.

Sup.—Two unicorns, erm.

Mot.—*A ma puissance.*

Stanhope, E. of Chesterfield. Quarterly, erm. and gu.

Cr.—A tower, az. with a demi-lion, ramp. or, issuing from the battlements.

Sup.—Dext. a talbot, guard. erm.; sin. a wolf erm.

Mot.—*A deo et rege.*

Cooper, E. of Shaftesbury; Arg. three bulls, passant, sab.

Cr.—A bull, passant, sab.

Sup.—Dext. A bull sab.; sin. a talbot, az.

Mot.—*Love. Serve.*

Villiers, E. of Jersey. Arg. on a cross, gu. five escallops, or.

Cr.—A lion ramp. arg.

Sup.—Two lions, arg.

Mot.—*Fidei coticula crux.*

Harley, E. of Oxford and Mortimer. Or, a bend dexter, cotised, sab.

Cr.—A castle, arg. with a demi-lion, ramp. issuing, gu.

Sup.---Two angels, proper.

Mot.--- *Virtute et fide.*

Fitz-William, E. Fitz-William. Lozengy, arg. and gu.

Cr.---A triple plume of ostrich feathers, arg.

Sup.---Two savage men, proper.

Mot.---*Appetitus rationi pareat.*

Viscounts.

Devereux, Viscount Hereford. Arg. a fess, gu. in chief, three torteauxes.

Cr.---A talbot's head, arg. erased gu.

Sup.---Dext. A talbot, arg.; sin. a rein-deer, gu.

Mot.--- *Virtutis comes invidia.*

St John, V. Bolingbroke. Arg. on a chief, gu. two mullets, or.

Cr.---On a wreath, a mount, prop. and therefrom a falcon rising, with bells, or.

Sup.---Two eagles, with wings expanded, or.

Mot.---Two are given. *Nec querere nec spernere honorem.* And *Nil admirari.*

Boscawen, V. Falmouth. Erm. a rose, gu. barbed and seeded, prop.

Cr.---On a wreath, a falcon, close, prop.

Sup.---Two sea-lions, arg. spotted with blue drops or guttes de larmes.

Mot.---*Patience passe science.*

Courtenay, V. Courtenay. Quarterly; first and fourth, or, three torteauxes; second and third, or, a lion rampant, az.

Cr.—On a wreath a dolphin, naiant, arg.

Sup.—Two boars, arg.

Mot.—*Ubi lapsus? Quid feci?*

Hampden Trevor, V. Hampden. Quarterly; first and fourth, arg. a saltier, gu. between four eagles displayed, az. for Hampden; second and third, party per bend, sinister, ermine and erminois, a lion ramp. or, for Trevor.

Cr.—A wyvern rising, sab. for Trevor, and a talbot, passant, erm. for Hampden.

Sup.—Two wyverns, regardant, sab.

Mot.—*Vestigia nulla retrorsum.*

Hood, V. Hood. Az. a fret, arg. on a chief, gu. three crescents, or.

Cr.—A Cornish chough, prop. on a wreath, vert and arg.

Sup.—Dext. a triton; sinist. a mermaid.

Mot.—*Ventis secundis.*

Barons.

Southwell, Lord de Clifford. Arg. three cinquefoiles, gu.

Cr.—A demi Indian goat, arg.

Sup.—Dext. a wyvern, gu.; sin. a monkey, prop.

Mot.—*Le roy le veut.*

Stourton, Lord Stourton. Sab. a bend, dext. or, between six fountains, prop.

Cr.—A demi grey-friar, habited in russet, girt, or, holding a scourge of three lashes, with knots, gu.

Sup.—Two sea-dogs, prop.

Mot.—*Loyal je serai durant ma vie.*

Verney, L. Willoughby de Broke. Gu. three crosses recercle, or, a chief vaire, ermine and ermines.

Cr.—The bust of a man couped, and affronte, prop.

Sup.—Two antelopes, arg. spotted, gu.

Mot.—*Vertue vaunceth.*

Dormer, L. Dormer. Az. ten billets, four, three, two, and one, or; on a chief of the second, a demi-lion rampant-naissant, sab.

Cr.—A right-hand glove, prop. surmounted by a falcon, arg.

Sup.—Dext. a falcon, prop.; sinist. a falcon, arg.

Mot.—Uncertain.

Byron, L. Byron. Arg. three bendlets, enhansed, gu.

Cr.—A mermaid, with her comb and mirror, all prop.

Sup.—Two horses, prop.

Mot.—*Credè Byron.*

Irby, L. Boston. Arg. fretty, sab. on a canton, gu. a chaplet, or.

Cr.---A Saracen's head, prop.

Sup.---Two antelopes, gu.

Mot.---*Honor fidelitatis præmium.*

Vernon, L. Vernon. Quarterly; first and fourth az. two bars, arg.; second, a fret, sab.; third, or, on, a fess, az. three garbs, of the field.

Cr.---A boar's head, erazed, sab.

Sup.---Dext. a lion gu.; sinist. a boar, sab.

Mot.---*Vernon semper viret.*

Rodney, L. Rodney. Or, three eagles displayed, purp.

Cr.---An eagle rising, purp.

Sup.—Two eagles, prop. holding banners of St George, gu. with naval coronets, or.

Mot.---*Non generant aquilæ Columbas.*

Chap. VI. Of Distinctions of Rank.

The notion, so confidently maintained by certain political fanatics, that mankind are naturally equal, is at variance with the plainest indications of Providence. The differences of sex, age, mental and bodily faculties, relationships, and circumstances, necessarily lead to various degrees of respect and authority among men; and the uniform testimony of history proves the establishment of ranks or classes among every society of human beings. The principle of subordination, indeed, seems as natural to our species as that of gravitation is to matter; and he who goes about to destroy it, while, in reality, he exemplifies its existence, only endeavours by its agency to gratify his own criminal ambition. Different forms of government allow different degrees of prominency to this principle; some urging it to excess, so as to destroy the natural and proper liberty of their subjects; and others again affecting to conceal or evade it by a nominal equality, which only leaves undefined the operation of those natural or adventitious peculiarities which actually occasion distinctions. The most general division of any society would be into the governors and the governed; and each of these great distinctions would be found divisible into parts. Thus we have, in the former, the legislative, the judicial, and the executive powers, each of which might be farther subdivided; and the latter of course would comprehend the various descriptions of subjects, classified according to their respective professions, trades, and means of livelihood. The discussion of rank as thus divided would necessarily occupy an immense space, as it is obvious that every form of government established in the world, and modified by a vast variety of circumstances, would claim to be considered under it. But this would be altogether foreign to our present purpose, which, strictly speaking, relates solely to the distinctions arising from the feudal system, chivalry, ecclesiastical dominion, the influence of learning and commerce, and which are recognized in the various communities of Europe. Even these are so numerous as to require volumes for their description and history; and we shall find it convenient, accordingly, to restrict ourselves almost entirely to those distinctions of rank which exist in our own highly favoured country.

Sect. I. *Degrees of Honour in general.*

These might be subdivided into civil or political, ecclesiastical, military and maritime, academical, and those of courtesy or that are simply nominal. But all the objects of this treatise will be accomplished by treating of them in a very popular order.

The terms *emperor* and *king* are generally applied to supreme or independent princes. The first is derived from the Latin word *imperator*, (*ex impero*,) signifying a commander, leader, or general of an army, and was in all probability used by Julius Cæsar and some of his royal successors, in preference to the name of *rex* or king, which had been formerly rendered odious to the Roman people. In course of time this aversion wore off, and the term *rex* or king was currently applied to the chief of the state, though in his letters he usually continued to style himself *imperator*. The Greek word for king is Βασιλευς, (Basileus,) by which accordingly the sovereigns of the empire are often denominated by the historians who wrote in that language. Owing to this circumstance, probably, the terms *imperator* and *rex* were held to be synonymous. On the division of the empire some new distinctions appear to have been made in them,—the princes of Constantinople commonly adopting the title of king, and those of the western portion that of emperor, this last being assumed in order to discriminate the supreme chiefs from the heads of those estates or provinces into which the greater part of Europe was divided. Yet it is remarkable that in course of time a controversy took place between the eastern and western princes, as to the title assumed by the latter, which the former refused; and it is certain that some of the German Emperors did not think the title of *rex* below their dignity. Again, it is matter of history that the title of *imperator* was assumed by princes, whose dominions did not extend beyond a single nation, as by Edgar of England, and Alfonso VII. of Castile in Spain. The lofty title of *rex regum*, king of kings, so frequently applied to eastern monarchs, was sometimes taken by princes in England when they had kings under them, as is proved by the learned Selden in his Titles of Honour. Our term *king* is deduced by the same author from the northern word *coning* or *konig*, signifying mighty or potent. Verstegan, quoted by Dr Johnson, in like manner derives it from the Teutonic *cuming* or *cyning*, denoting stout or valiant, an allusion probably to the very quality whence their dignity was originally derived. The word *queen*, supposed by some writers to be derived from *konigen*, is deduced by Selden from *quen*, signifying the same as *comes* or *companion*; and he thinks this confirmed by the fact of the queen having been usually denominated in the French statutes of the kingdom, *le compagnon nostre seigneur le roy*; or in Latin, *consors nostra*, as, in the civil law, the empresses are styled *consortes Augusti*. But it is with perhaps more propriety derived from an old Teutonic word, *quena*, signifying simply a woman or wife, the queen being so called in the most eminent degree. On this account, perhaps, Fr. Junius has not erred greatly in deriving it from the Greek word for a woman or wife.

Here it may not be irrelevant to mention, that, considered as the king's companion, the wife of the reigning king, that is, in the legal phrase, the *queen consort*, differs from all other married women in our country, by being held as a distinct personage from her husband,—in virtue of which she can purchase and convey lands, make leases, grant

Distinctions of rank.

copy-holds, and "do other acts of ownership," without the concurrence of her lord; enjoys a great variety of rights, privileges, and powers; and in reality is in all legal proceedings regarded as a *feme sole*, (a single woman) and not a *feme covert* (married woman.) It is scarcely necessary to say that in Britain, the queen *regent*, *regnant*, or *sovereign*, that is, she who holds the crown in her own right, enjoys the same powers, privileges, dignities, and rights, as if she were a king.

The common style in addressing the king is, Sir or Sire, your Majesty, or your most gracious Majesty; and the Queen is addressed Madam, your Majesty, &c.

In the larger sense of the term, *royal family*, are comprehended all those persons who are by any possibility inheritable to the crown; but, in the more limited acceptation, it includes those only who are within a certain degree of propinquity to the sovereign,—others who may be distantly related to him being ranked with ordinary subjects. It seems to be determined that under the denomination of the king's *children*, his *grandsons* are included. It is usual to apply the title of *prince* or *princess* to the descendants and *nearest* relations of the reigning king, and they are farthermore distinguished by the phrase *royal highness*.

The title *prince of Wales* is given to the heir apparent to the crown, who is also usually made Earl of Chester by special creation and letters patent under the great seal; but to another dignity, that of duke of Cornwall, the king's eldest son succeeds by inheritance, without any new creation. In the event of his death without issue, this last title, with its accompanying advantages, goes to the second son by inheritance. In reality, then, it can only be enjoyed by the king's eldest son, (living,) and heir-apparent to the crown; and, which is singular, the individual who is entitled to it is conceived to be *born of full age*, and is therefore subject to no minority. A brother of the king cannot be duke of Cornwall, and consequently is not *heir-apparent* to the crown; it being always held possible that the king may have a son. There is a real difference, therefore, between *presumptive heir* and *heir-apparent*. The consort of the prince of Wales, entitled the princess of Wales, is peculiarly regarded by the laws, as she by whom issue may be furnished to the crown; and the eldest daughter of the king, denominated the princess-royal, and who is inheritable to the crown, on failure of male issue, is also more respected and guarded by the laws than her younger sisters.

Besides their common title as princes, the male members of the royal family are usually at a certain age made peers of the realm by specific creation. Thus we have the duke of York, born in 1763, so made in 1784; the duke of Clarence, born in 1765, so made in 1789; the duke of Cumberland, born in 1771, so made in 1799; the duke of Sussex, born in 1773, so made in 1801; and the duke of Cambridge, born in 1774, so made in 1801. The princess Alexandrina Victoria, succeeds to the title of duchess of Kent, in right of her father, the lamented duke of Kent, who was born in 1767, and was so made in 1799. The duke of Gloucester, cousin of the present king, succeeded his own father in the title in 1805.

Distinctions of rank

Here it may be worth while to state, very generally, some of the principal rights or prerogatives of the king in England.

1. As to his royal dignity. He is considered by the law as possessing the attribute of sovereignty, or pre-eminence; in consequence of which he is said to have *imperial* dignity; his realm is declared to be an *empire*, and his crown is *imperial*,—expressions denoting his being as independent within his dominions as any emperor is in his empire, and that he owes no sort of subjection to any other earthly potentate. The law also ascribes to him, in his political capacity, the quality of *perfection*, so that he is held to be incapable of either doing or thinking what is wrong. Farther, he is conceived to possess *perpetuity*, an absolute immortality,—so that he never dies, or can die; the king surviving the decease of any and every individual on whom the title devolves.

2. As to his representative power. In the character of chief of his people, invested with the power of the state, the king alone is supposed to transact the national affairs with foreign princes. As such, therefore, he sends and receives ambassadors; makes treaties and alliances with other powers; and declares war and peace.

3. As to his domestic or paternal relations. He is a constituent part of the supreme legislative power, and can as such reject such provisions proposed by it as he judges to be improper. He is the generalissimo of the armies and fleets; the first in command of all those means and measures of strength which are thought requisite for the protection of the community and the support of the national honour. He is the source or fountain, or rather the distributor of justice, and the general conservator of the peace of the kingdom; by virtue of which prerogative he is conceived to be legally present in all the courts of the kingdom, and therefore to possess the quality of *ubiquity*. He is also the fountain of honour, of office, and privilege, and that in such a sense that he is considered as the *parent* and *creator* of them all. And he is the arbiter of all domestic commerce; so that he can establish markets and fairs, determine the tolls belonging to them, regulate weights and measures, and give authority and impress to the metals as the medium of exchange. Lastly, he is the head and supreme governor of the national church; in right of which he can convene, regulate, and dissolve ecclesiastical convocations, nominate to vacant sees and other preferments, and is the last appeal in all ecclesiastical causes.

Considered in relation to the important powers and prerogatives now mentioned, the king has necessarily a great variety and number of advisers and servants, over and above those who may be styled his private or personal attendants. They are very expressively denominated in the words so universally used in public worship, "*all those who are in authority under him*." We may mention the chief of them.

1. As to those whom the law assigns him for the benefit of council. Here we find the high Court of Parliament, summoned by his writ or letter, and therefore convened by his authority; and which consists of himself, in his political capacity, and the

Distinctions of rank.

three estates of the realm, namely, the lords spiritual, the lords temporal, both of whom sit together, with the king, in one house; and the commons, or representatives of the commons, that is, of all the people under the rank of peers, who sit by themselves in another. In virtue of their relation to this high council, the members enjoy certain privileges. Thus, for example, they have all the privileges of speech, when assembled on the affairs of the kingdom; they cannot be arrested and taken into custody, unless for an indictable offence; and they have the power of *franking* letters. The members of the upper house, or, as it is often called, the House of Peers, are noble by inheritance or creation, and are designated according to their respective titles. Besides their forming a part of the great council of the king and nation, the peers of the realm are by their birth hereditary counsellors of the crown, and as such may be called together by the king, even when there is no Parliament in existence, to give advice on such subjects of importance to the state as he may think proper to lay before them; and, moreover, it is the understood right of each individual peer to demand an audience of the king for the purpose of imparting to him counsel relative to the public welfare. Another council, belonging to the king, consists of the judges of the courts of law, whom he may assemble when he thinks fit, for the benefit of their opinion on legal subjects. But the council to which the king has most recourse, and which, accordingly, is familiarly denominated *the council*, is an assembly of such persons, of whatever rank, whom he may honour by his confidence, and call together in any suitable place for the purpose of delivering their sentiments on the affairs of his administration. The persons thus signalized are termed privy-counsellors, and are chosen by an act of the royal will, which also regulates their number and the times of their meeting. Formerly they seldom amounted to more than twelve; but in modern times they have been so greatly increased, that any individual who might happen to be prime minister could be at no loss to select from them those persons who were likely to concur in his general views of policy. What is called, therefore, the cabinet council, by which the affairs of the nation are deliberated on in the first instance, and matured for the public view, consists of those ministers of state whom the king entrusts with his measures, who are selected at his pleasure, and who respectively receive a summons for every attendance.

2. In relation to the king being the general distributor of justice and conservator of peace in the kingdom, we may mention those officers who belong to the superior courts of justice. The lord chancellor or judge who presides in the high court of Chancery, which is the most important, as to matters relating to civil property, of the king's superior courts of justice, is a privy-counsellor by his office, and prolocutor or speaker in the House of Lords; he has the custody of the king's great seal, and is considered keeper of the king's conscience; possesses the power of appointing all the justices of peace throughout the kingdom; is visitor, in right of the king, of all hospitals and colleges of royal foundation; patron of all the king's livings below a certain value; is the general guardian of all infants, idiots, and lunatics; and has the superintendance of all charitable uses in the kingdom. In the court of which he is president are various officers, as the *master of the rolls*, a *vice-chancellor*, and *masters in Chancery*. The court of King's Bench, which is the supreme court of common law in the kingdom, consists of the *lord chief-justice* and three *puisne justices*, who are, by their office, the sovereign conservators of peace, and supreme coroners of the land. The court of Common Pleas, where all civil actions between the subjects may be tried, has also a *lord chief-justice* and three *puisne justices*. The court of Exchequer, which takes cognizance of matters relative to the revenue, has a *chancellor*, who is usually one of the chief ministers of state, a *lord chief baron*, and three *barons*. Of the inferior and local courts, and a great variety of other officers, referrible to the same head, it is unnecessary to take particular notice. We may merely mention the names of *sheriffs*, *coroners*, *justices of the peace*, and *constables*.

3. As generalissimo, the king has under him all the military and naval ranks, as *commander-in-chief*, *field-marshals*, *generals*, *lieutenant-generals*, *major-generals*, *colonels*, &c.; *admirals*, *vice-admirals* and *rear-admirals* of the red, white, and blue; *captains*, &c. And under this title might be comprehended the *secretary at war*, *the lords commissioners of the Admiralty*, *master-general of the Ordnance*, and many other officers.

4. As head of the national church, the king has jurisdiction over *archbishops* and *bishops*, *arch-deacons*, *deans*, *prebends*, *parsons*, *vicars*, and *curates*; to which may be added *church-wardens*, *parish-clerks*, and *sextons*.

5. Under the relation of arbiter of commerce, may be comprehended those officers who belong to the mint and the post-office.

6. As regards his majesty's supremacy over the revenues of the kingdom, may be mentioned those officers who belong to the departments of the treasury, customs, excise, and stamp-duties.

7. In relation to his being the source of honour and dignity, and the chief personage in the state, the king has a numerous household, consisting of a *lord-chamberlain*, a *vice-chamberlain*, a *groom of the stole*, several *lords and grooms of the bed-chamber*, a *lord-steward*, *comptroller*, *treasurer*, *paymaster*, *master*, *master of the robes*, *keeper of the privy purse*, *yeomen of the guard*, *band of pensioners*, *grand falconer*, *master of the stag-hounds*, *master of the horse*, *lord almoner*, *chaplains*, *master of the ceremonies*, &c. &c. He is also head of the herald's college, where we find a *hereditary earl marshall*, a *deputy earl marshall*, *garter principal king of arms*, *Clarencieux king of arms*, and *Norroy king of arms*. And besides being superior to all the nobility, which is conceived to have emanated from him, he is sovereign or patron of the various orders of knighthood, as of *the Garter*, *the Thistle*, *the Bath*.

In the kingdoms of Scotland and Ireland, it need hardly be mentioned, there are separate establishments and office-bearers, analogous to those which have now been enumerated, and which all recognize the king as chief.

Sect. II. *Of Titles of Honour and Respect.*

It is now time to specify more particularly some of the honorary distinctions or titles of dignity and office which most frequently occur in Britain; and also to indicate the order of precedence to which they are entitled on occasions of state and public ceremonies.

The titles of nobility, or the peerage, now in use with us, are Duke, Marquis, Earl, Viscount, and Baron; of which in order.

Duke, a word derived from the Latin *dux*, signifying a commander or leader of an army, is the first title of dignity after the royal family, but not the highest in point of antiquity. It is thought to have been introduced into England by Edward III., about a year before he himself assumed the title of king of France. Then was Edward the Black Prince created duke of Cornwall, being the first duke in England after William the Conqueror. But it was probably merely laid aside, or allowed to go into desuetude in compliment to this monarch, whose own title was only that of duke of Normandy; for the term *dux* frequently occurs during the Saxon reigns, as is made evident by Selden out of various charters. According to the same author, it was first given in Scotland, in the reign of Robert III., namely, to his son David, created duke of Rothsay, a title of late bestowed on the eldest prince of the blood. After the creation of the duke of Cornwall in the person of the Black Prince, the title of duke was frequently given, especially to members of the royal family. Nevertheless, in the reign of Elizabeth, the whole order became extinct, and was not revived till the reign of her successor James I., who bestowed it on his favourite, George Villiers, made duke of Buckingham.

Marquis, the next title of nobility, is a term derived from the Teutonic *marche*, a word signifying a limit or boundary, the officers so called having originally been appointed to guard the frontiers of a kingdom. Hence they were styled *lords marchers*, and subsequently marquisses. Their peculiar authority was abolished in the reign of Henry VIII; but long before that time the title was considered merely an honorary one, as appears by Robert Vere, earl of Oxford, being created marquis of Dublin by Richard II. who afterwards farther ennobled that minion by the title of duke of Ireland. James VI. of Scotland, is conceived to have been the first monarch who bestowed this title in that kingdom, which he did on John Hamilton, son of James duke of Chatelherault.

The title of *Earl*, or, as it was often rendered, *comes*, whence our word *count*, is of very high antiquity among us, being well known to the Saxons under the name of *ealdormen*, that is to say *elder men*, and also *schiremen*, because each of them had the government of a distinct shire, or as it is now often called *county*. Indeed, under the Saxons, the titles of dux and comes, duke and earl or eorl, appear to have been frequently used synonymously. They were then, it seems, both officiary and honorary; but, for a long time, the individuals so denominated among us have had no specific government of the county or shire whence their name is taken. The king in mentioning an earl in any writ or commission, usually styles him "trusty and well beloved *cousin*," a peculiarity as ancient as the reign of Henry IV. who was actually related to all the earls then in the kingdom, and who might consequently adopt it with some appearance of truth, which does not now exist.

The title of *Viscount*, that is, *vice-comes*, which signifies the same as sheriff in English, was first used as officiary, and then became simply honorary. He appears to have been frequently denominated the *ealdorman* in Saxon times; but not so much to have been placed under the *eorle*, as appointed by the king *in vicem comitis*, (that is, as a judge,) to administer justice, and attend to the royal revenue. Hence an appeal lay from him to the King's Bench, but not to any intermediate court. The first grant of the merely honorary title in England was in the reign of Henry VI. who by patent made John of Beaumont viscount of Beaumont; and the first in Scotland was by James VI. in favour of Thomas Ereskin, created viscount Felton.

The title of *Baron* is the most universally used of all the denominations of nobility, being frequent throughout all the European countries in early times, and of great antiquity. There is a good deal of controversy among learned men about the origin and primitive meaning of the term. It is found in some of the Latin classics, but undoubtedly in a sense very different from what it now imports, and may probably have crept in among the Romans from some of the northern people. In the ancient laws of the Almains, Ripuarians, Salians, and others, according to Selden, the word *baro* often occurs, and stands for *man*, in distinction from the female sex; it seems afterwards to have been adopted by the early French and Dutch writers, in the sense of a ministering servant, but of what description does not exactly appear. It was early introduced into England, where for a time it was occasionally used as synonymous with *homo* a *man* or a *citizen*. Thus the citizens of London were anciently denominated *Barones London*. But though originally, and for a long time, it signified apparently a man, it came at last to denote specially the king's man-servant, tenant, or officer, that is, a person employed by him, of some note and in a particular manner, probably in relation to a territorial jurisdiction, of less extent or consequence than that under a marquis, count, or viscount. The name of a *barony*, accordingly, expressed a feudal territory, in which sense it is often used by foreign writers. It appears to have been generally subordinate to one of the greater peers, who consequently added the title to their other designations, and frequently appointed their own barons under them. Hence we find it so often conjoined with the higher titles; and, indeed, there were few of the peers who had not originally baronies annexed to their titles. But as the ancient barons were occasionally raised to a new degree of peerage, it happened, in the course of time, that the two titles became disjoined, one of them descending, perhaps, to the male heir, and the other to the heirs general.

Distinctions of rank.

So now we find that all peers are not barons. In speaking of the original and antiquity of baronies, Blackstone writes what it may be worth while quoting, in place of any other observations on the subject. "The most probable opinion seems to be, that they were the same with our present lords of manors, to which the name of court baron, (which is the Lord's court, and incident to every manor,) gives some countenance. It may be collected from John's *Magna Charta*, that originally all lords of manors, or barons that held of the king *in capite*, had seats in the great council or parliament; till about the reign of that prince the conflux of them became so large and troublesome, that the king was obliged to divide them, and summon only the greater barons in person; leaving the small ones to be summoned by the sheriff, and (as it is said) to sit by representation in another house, which gave rise to the separation of the two houses of parliament. By degrees the title came to be confined to the greater barons or lords of parliament only; and there were no other barons among the peerage, but such as were summoned by writ, in respect of the tenure of their lands or baronies, till Richard the second first made it a mere title of honour, by conferring it on divers persons by his letters patent." It will be easily understood, from what has already been mentioned, how the term baron should be extended to certain office-bearers, whether in the civil or ecclesiastical departments of the state. Thus, some of the higher orders of the clergy were barons by reason of their office, and in consequence of their temporalities, as the bishops, and certain of the abbots and priors. "All bishops," says Selden, "were ever parliamentary barons, not all abbots and priors." Before the time of Malcolm II. according to this author, there was no dignity in Scotland above that of knight, but only *thane*, a word frequently used in England in the Saxon times, and originally denoting, it seems, nearly the same as *baro*. It probably became at one time restricted to the office of *steward* in Scotland. Thus, Walter, nephew to Banqhuo, was created *Abthan*, or great steward of Scotland, by Malcolm II. and from him it is conceived the royal name of *Steward* or Stuart had its origin, "and began first to be honoured with a crown in their Robert II. the honour of the office being part always of his birth-right who is prince of Scotland." "They have also," he continues, "agreeable with the identity of *thane* and *steward*, certain *stewartries* at this day. But the word with them signified questionless as with us anciently, and was of the same Saxon root. For their right Scotish or Irish called a *thane Tosche*, and the son of a *thane Mactosche*. But after Malcolm his bringing in of *barons*, *thanes* remained as a distinct name of dignity, and vanished not at the innovation of new honours, as at our Norman conquest."

These five titles, then, are all that are now appropriated among us to the nobility, Duke, Marquis, Earl, Viscount, and Baron, who, though differing, as we have seen, in rank, are, notwithstanding, *peers* in respect of their nobility. In like manner, commoners, though in law considered as *peers*, in respect of their want of nobility, are divided into several degrees,—of which we have now to treat.

The name of dignity next below that of a peer was in early times that of *vidome*, *vice-dominus*, or *valvason*, entirely disused in modern times, and about the original of which the antiquarians are not decided. Now the first personal dignity in succession to the nobility is that of a *knight* of the order of St George, or *of the Garter*, which was first instituted by Edward III. A. D. 1344.

Then follows, in the absence of certain official dignitaries, such as *privy counsellors*, the *chancellors of the exchequer* and duchy of Lancaster, the chief-justice of the king's bench, and some other judges,—a *Knight-banneret*, who is occasionally, indeed, ranked next after barons. He is so styled from his right to wear a *banner*, or flag of a particular form, and distinguished from a *pennon*, and under which he had, in former times, from twenty-four to fifty or more *gentlemen*, or *men-at-arms*, with their attendants. "That community," says Selden, "of the right of advancing a square ensign, charged with arms, which both barons and bannerets enjoy, was the cause why the name of *banneret* and *baronet* hath been by some confounded, and the one anciently written for the other." If the knight-banneret "have been created by the king in person, in the field, under the royal banners, in time of open war," he is entitled to the rank here assigned him; but, otherwise, he ranks after

The *Baronet*, whose title is a dignity of inheritance, and not merely a military honour of knighthood, as Selden seems to imagine. It is created by letters-patent, and usually descends to the male-issue. It was originally instituted by James I. in 1611, "in order," says Blackstone, "to raise a competent sum for the reduction of the province of Ulster in Ireland; (for which purpose, 100 gentlemen, who obtained this title, advanced L.1000 each;) for which reason all baronets have the arms of Ulster (a hand *gules*, or a bloody hand in a field *argent*) superadded to their family coat."

Next come *Knights of the Bath*, an order instituted by Henry IV., revived by George I., and new-modelled by the Prince Regent (now George IV.) in 1815. It is divided into two classes,—the first comprehending *military knights grand crosses*, *civil knights grand crosses*, and *honorary knights grand crosses*; and the second, consisting of *knights commanders*.

The last of the inferior nobility now treated of are *Knights-bachelors*, the most ancient, though the lowest, order of knighthood we have. The word *bachelor*, it may be observed, is probably derived from *bas* and *chevalier*, signifying an inferior knight, and has been latinized, barbarously enough, *baccalaureus*. "The lowest graduates in the universities," (says Mr Christian, in his Notes on Blackstone,) "are *bachelors*, and were, till lately, addressed with *sir* before their surname, as in Latin they are still called *domini*. It is somewhat remarkable, that whilst this feudal word has long been appropriated to single men, another feudal term of higher dignity, viz. baron, should, in legal language, be applied to those who are married." Here, too, it is right to notice, that the word *knight*, so extensively used, does not appear to have any reference to a horse, as has commonly been imagined,—*knight*, in the

Distinctions of rank.

Saxon tongue, whence it is taken, signifying *puer*, *servus*, or attendant. Knights, however, are called in Latin *equites aurati*,—*equites*, because they always served on horseback, and *aurati* from their wearing gilt spurs. They are also called *milites*, because, in virtue of the feudal tenures originally enjoyed by them, they formed part of the royal armies.

The title of *Esquire* is now merely a name of *worship* or respect, not of dignity. According to Camden there are four sorts of persons to whom it may be applied. 1. The eldest sons of knights, and their eldest sons in succession. 2. The eldest sons of younger sons of peers, and their eldest sons in like succession. 3. Persons created *esquires* by the king's letters-patent, a creation that has long been disused. 4. Certain persons by virtue of their offices, as justices of the peace, and all on whom in the commission of appointment the title is bestowed. To which may be added a fifth class, namely, those so made by knights of the Bath, each of whom constitutes three at his installation; " and all foreign, nay Irish peers, (says Blackstone); for not only those, but the eldest sons of peers of Great Britain, though frequently titular lords, are only esquires in the law." And a sixth class might be formed of barristers, or advocates, and counsellors, and various other persons, to whom, by established courtesy, if not right, the title is given.

The name of *Gentleman*, another title of worship, to which the term Master, or for contractions sake M^{r}, is related, is of still greater extent of application. " As for gentlemen," says Sir Thomas Smith, " they be made good cheap in this kingdom; for whosoever studies the laws of the realm, who studieth in the universities, who professeth the liberal sciences, and (to be short) who can live idly and without manual labour, and will bear the port, charge, and countenance of a gentleman, he shall be called *master*, and shall be taken for a gentleman." According to the heralds, a gentleman is one who bears a coat of arms.

Of the ecclesiastical, military, and naval titles, we hold it superfluous to say any thing more than has been already stated, as their respective rank will be speedily indicated; and the same remark applies to the academical dignitaries, of which it is enough to mention merely the names.

The rest of the community comprehends *tradesmen*, *artificers*, and *labourers*. " These," says Mr Christian, in an excellent paragraph, from which it may be highly useful to extract a few sentences, " are the ranks and degrees into which the people of England are divided, and which were created and are preserved for the reciprocal protection and support of each other. Subordination in every society is the bond of its existence; the highest and the lowest individuals derive their strength and security from their mutual assistance and dependence; as in the natural body " *the eye cannot say to the hand, I have no need of thee; nor, again, the hand to the feet, I have no need of you.*" True liberty results from making every higher degree accessible to those who are in a lower, if virtue and talents are there found to deserve advancement. No one in this happy country is for ever condemned to continue in the lowest rank or *cast*; but whilst he does his duty in that station in which it has pleased God originally to place him, he may prove that he is deserving of advancement to a higher step in the gentle gradation of a free constitution. Such is the excellence of the British government, that the son of the lowest peasant may rise by his merit and abilities to the highest stations in the church, law, army, navy, and in every department of the state; nor is there any limit to the accumulation of his wealth by honest industry."

SECT. III. *Of Precedence.*

On the subject of precedence no little discrepancy exists among writers,—a very natural consequence of the great variety of claims and titles which have to be decided. Several statutes have passed the legislature at different periods, determining some of the points at issue. These are alluded to by Blackstone, who gives a table of precedence marked in relation to those authorities, letters-patent, and established custom. As in many respects it is important, and will serve to exemplify some of the preceding illustrations of the distinctions of rank, we think it proper to be inserted. In examining it, then, let the reader observe the meaning of the annexed marks. Those gradations distinguished thus * are determined by statute 31. Henry VIII. c. 10; those marked † by statute 1. Will. and Ma. c. 21.; those marked ‖ by letters-patent, and 14. Jac. I.; and those marked ‡ by ancient usage and established custom. We shall add numbers for the greater convenience of reference.

Table of Precedence according to Blackstone.

1. * The King's children and grandchildren.
2. * . . . brethren.
3. * . . . uncles.
4. * . . . nephews.
5. * Archbp. of Canterbury.
6. * Lord Chancellor, or keeper, if a baron.
7. * Archbishop of York.
8. * Lord Treasurer.
9. * Lord President of the Council. } if barons.
10. * Lord Privy Seal.

11. * Lord Great Chamberlain.
12. * Lord High Constable.
13. * Lord Marshall.
14. * Lord Admiral.
15. * Lord Steward of the household.
16. * Lord Chamberlain of the household. } Above all peers of their own degree.
17. * Dukes.
18. * Marquisses.
19. ‡ Dukes' eldest sons.

20. * Earls.
21. ‡ Marquisses' eldest sons.
22. ‡ Dukes' younger sons.
23. * Viscounts.
24. ‡ Earls' eldest sons.
25. ‡ Marquisses' younger sons.
26. * Secretary of State, if a bishop.
27. * Bishop of London.
28. * . . . Durham.
29. * . . . Winchester.
30. * Bishops.
31. * Secretary of State, if a baron.

Distinctions of rank.

32. * Barons.
33. † Speaker of House of Commons.
34. † Lords Commissioners of Great Seal.
35. ‡ Viscounts' eldest sons.
36. ‡ Earls' younger sons.
37. ‡ Barons' eldest sons.
38. || Knights of the Garter.
39. || Privy Counsellors.
40. || Chancellor of Exchequer.
41. || Chancellor of the Duchy.
42. || Chief Justice of the King's Bench.
43. || Master of the Rolls.
44. || Chief Justice of the Common Pleas.
45. || Chief Baron of the Exchequer.
46. || Judges, and Barons of the Coif.
47. || Knights bannerets, royal.
48. || Viscounts' younger sons.
49. || Barons' younger sons.
50. || Baronets.
51. ‡ Knights bannerets.
52. ‡ Knights of the Bath.
53. ‡ Knights bachelors.
54. || Baronets' eldest sons.
55. || Knights' eldest son.
56. || Baronets' younger sons.
57. || Knights' younger sons.
58. ‡ Colonels.
59. ‡ Sergeants at law.
60. ‡ Doctors.
61. ‡ Esquires.
62. ‡ Gentlemen.
63. ‡ Yeomen.
64. ‡ Tradesmen.
65. ‡ Artificers.
66. ‡ Labourers.

Married women and widows are said, on the same authority, to be entitled to rank among each other as their husbands would between themselves, unless such rank be merely professional or official; and unmarried women have the same rank as their eldest brothers would bear among men during the lives of their fathers. In two late heraldic processions, namely those of the funerals of Lord Nelson and Mr Pitt, it has been remarked, that masters in chancery and serjeants at law had precedence of knights; and that bachelors and masters in chancery had the place inferior to serjeants at law. According to the heralds, admirals and captains in the navy, generals, colonels, and officers in the army, have no rank or place assigned them in procession.

It is not very easy to discover any peculiar principle of arrangement in this table, much of which, it is obvious, can only be maintained on the ground of authority or arbitrary power. Indeed precedence, however determined, must always partake somewhat of caprice and fiction, more especially in the minor relations. Mr Brydson has probably shewn as much judgment and comprehension of mind on this subject as in any part of his work; and as his views of rank are fully more extensive in their application, and more scientific, if the expression be allowable, than those which are contemplated above, it may be proper to present them in a modified form to the reader.

Using the word estate in the sense of that order or condition which mankind hold in society, the inhabitants of Britain may be divided into four estates, namely, the king, the lords spiritual, the peers, and the commons. The first of these comprehends only the king, or sovereign queen, who possesses a third share of the supreme legislative power, presides over all the members of the other estates, and enjoys the great variety of rights, dignities, and authority, formerly enumerated. But though there be but one individual so constituted and endowed, there are several personages who in some measure partake of his pre-eminence and honour. Such are the queen-consort and queen-dowager; ambassadors, or those public ministers of the first order, who represent foreign monarchs and powers; regents of the British dominions, and the viceroy of Ireland. To a share in the pre-eminence of the first estate, but inferior to these, and which cannot so properly be considered as included under it, are the princes and princesses of the royal family; governors of provinces; commanders-in-chief of fleets and armies; high officers of state; judges of sovereign courts, and certain other public ministers, as, for example, the lord high commissioner to the church of Scotland. This personage presides in an assembly "which, besides the clergy, includes members of all the orders that at the time of the union composed the parliament of Scotland." He could not be ranked exactly with the viceroys of Ireland previous to the union with that kingdom, inasmuch as this latter personage presided over the same orders when actually assembled in parliament, where he was the representative of the king; nor does his power approach any way near to that of the viceroy, modified as it now is by the political constitution of Ireland having been merged in that of the three united kingdoms. Farthermore, it may be remarked, that as the church of Scotland is not hierarchical, and acknowledges no head "on earth," the king has no canonical or spiritual jurisdiction over it, and consequently his representative or commissioner has not even a deliberative voice in the proceedings of its general assembly over which *he seems to preside.*

The second estate, that of the lords spiritual, comprehends the two highest orders of ecclesiastical dignity established in the kingdom, those of archbishops and bishops, who on ordinary parliamentary occasions appear in their clerical habits, but when the king is present, and on certain trials not leading to capital punishment, wear scarlet robes, like those of temporal lords. As the canon law prohibited their judging in cases of capital crimes, it is usual for them to withdraw on such occasions, which they do with a reservation, and under a protest as to their *right* to be present as judges. An archbishop has the title of Grace, and *Most reverend father in God by divine providence*; a bishop, that of *Lordship*, and *Right reverend father in God by divine providence.* The former precedes dukes, or peers of the first degree who are not of the royal family; and the latter has precedence of barons, or peers of the fifth degree. Their wives and families do not share in their honours, which besides are not transmissible by inheritance,—clear indications that they are conceived to be built on a different foundation from those of the secular nobility. The title archbishop is usually conjoined with the office of primate and metropolitan, implying a superiority over diocesans. Besides the archbishops and bishops of England, entitled to sit in the House of Lords, there are four elected in Ireland to represent the body, since the union with that kingdom. Scotland of course sends none.

The third estate, in the sense explained, includes those five orders of nobility already described, all of whom, provided they qualify by oath, are entitled to a place in the House of Lords; to which are to be added 16, who represent the peerage of Scotland, and 28 that of Ireland. Under the denomination of British Peerage are included many individuals who either may or may not enjoy titles of nobility peculiar to Scotland or Ireland; but who, from the circumstance of their being thus denominated, have a right to a place in the House of Lords, where they may sit, consequently, with inferior titles to those by which they are elsewhere recognized. The duke of Athol, for example, sits only as earl Strange, and the duke of Montrose as earl Graham. Peers of this description are not eligible to be of the number of the representatives for their respective countries. The wives and widows of peers are also peeresses; but they lose their rank on marrying commoners, which those females do not who are peeresses in their own right. The precedency of the peerage is regulated according to their degrees and the dates of their creation.

Considered as a branch of the legislature, the fourth estate admits of three distinctions,—the representatives of the people, or commons in parliament, the electors of those delegates, and the people at large. But as a distinction of rank merely, it includes all those persons who do not belong to one of the preceding orders. It is divisible into classes.

The first comprehends those who by courtesy only possess titles appropriate to the peerage, as dowager-peeresses, who have married commoners; the eldest sons, and their wives, of dukes, marquisses, and earls, who have the same titles as if they were peers in an inferior degree to that of their fathers. All the daughters of dukes, marquisses, and earls, have the title of lady prefixed to their names; the younger sons of dukes and marquisses that of lord; and those of earls, viscounts, and barons, are termed honourable. Several individuals are entitled, in consequence of their offices, to rank above sons and daughters of peers, though these be reckoned the first order of the commons. The second class includes three ranks of official lords: 1. Great officers of state, as lord high chancellor, or lord keeper of the great seal, not being a peer; other officers of an inferior degree, as the lord register, lord advocate, lord justice-clerk of Scotland; the lord steward and lord chamberlain of the royal household; the lord lyon king-at-arms in Scotland. 2. Certain high officers of the superior courts of law, as the lords chief justices of the king's Bench and Common Pleas; the lord president and senators of the College of Justice; lord chief-baron of Exchequer; lords commissioners of justiciary. 3. Such official lords as have municipal charges or local jurisdictions; as lords wardens of the Cinque-ports and Stanneries; the lords mayors of London, Dublin, and York, the lord provost of Edinburgh. The title of *My lord* is applied to all these individuals of this class, as well as to all the five degrees of the peerage, and the spiritual lords, archbishops, and dukes, have also that of *Grace*. But the dignity implied in the title *lord* is not held by the wives of the several lords above-enumerated, with the exception of the lady of the lord mayor.

The third class of the fourth estate will comprehend knights of every description, and baronets, and some other personages. And here it may be remarked, there are two classes of females who hold the rank belonging to the titled lord, not by courtesy, but by virtue of the dignity enjoyed by their husbands, namely, the wives of knights of every order, and those of baronets, both of whom are distinguished by the title lady, though their husbands are not addressed by that of lord, but that of sir, (sieur, signeur,) a word of similar import. Knights of the higher orders precede baronets, but their wives, on the contrary, are preceded by baronetesses; the dignity of knighthood being only personal, whereas that of the baronetage is hereditary. On the same principle, those dignities which are official or professional, generally speaking, are not communicable to the wives of the possessors. The dignity of baronetage, in reality, is the only one belonging to the commons that is hereditary, and not one of the dignities belonging to this fourth estate is essential to the constitution. The titles or styles of excellency, right honourable, and honourable, are applied to various individuals among the commons who hold official situations; the first belongs to commanders-in-chief of fleets and armies, and the governors of provinces; the second to privy counsellors; and the third to such of the sons and daughters of peers as are not distinguished by the titles lord and lady.

The fourth class of the fourth estate, that of the gentry, includes all persons who have precedency or rank next to that of knighthood and baronetage. They are of various degrees, and may be thus arranged: the sons of baronets and knights, styled generally *esquires*; field-officers of the army, and officers of the navy of corresponding rank; graduates of the highest order in the professions of law, divinity, medicine, and music; all others who, from respectability of birth, office, commission, education, fortune, or eminence, have the style of esquire, and are reckoned gentlemen, as magistrates, the inferior clergy, certain subaltern officers in the army and navy, counsellors or advocates, clerks to his majesty's signet in Scotland, persons of wealth and reputation, considerable merchants and traders. Wives participate in the rank of their husbands, if superior to their own, and either hereditary or personal, to which, by courtesy, is commonly added official. The law recognizes none of the minor differences of rank; and, according to the constitution of our country, there is no barrier between those who are styled gentry and persons without any honorary distinction, as the latter daily obtain rank by acquiring property, or getting into various official situations.

Nisbet, in his Heraldry, adjusts precedence in a brief but decisive manner. So far as it relates to Scotland, it may be worth exhibiting his plan in an abridgement.

Distinctions of rank.

1. Dukes of the blood royal.
2. Other dukes, according to their creation.
3. Eldest sons of dukes of the blood-royal.
4. Marquisses, according to their creation.
5. Dukes' eldest sons.
6. Earls, according to their creation.
7. Marquisses' eldest sons.
8. Dukes' younger sons.
9. Viscounts, according to their creation.
10. Earls' eldest sons.
11. Marquisses' younger sons.
12. Barons.
13. Viscounts' eldest sons.
14. Earls' younger sons.
15. Barons' eldest sons.
16. Baronets.
17. Viscounts' younger sons.
18. Knights-batchelors.
19. Barons' eldest sons.
20. Lairds, (a corruption of lord) or landed gentlemen.
21. Professors of the sciences in their order, doctors in each having the precedence.
    1. Theology.
    2. Canon law.
    3. Civil law.
    4. Philosophy.
    5. Medicine.
    6. Rhetoric.
    7. Poesy.
    8. History.
    9. Grammar.
    10. Logic.
    11. Arithmetic.
    12. Geometry.
    13. Music.
    14. Astronomy.

King James VI. settled the precedency among his officers and counsellors thus:

1. Lord Chancellor.
2. Lord Treasurer.
3. Archbishop of St Andrews.
4. Archbishop of Glasgow.
5. Earls and Viscounts according to their ranks.
6. Bishops according to their ranks.
7. Lord Privy Seal.
8. Lord Secretary.
9. Lord Register.
10. Lord Advocate.
11. Lord Justice-Clerk.
12. Lord Treasurer depute.
13. Lords of Session according to their admission.
14. Barons and gentlemen, being counsellors, according to their admission.

Distinctions of rank.

By act of Parliament in 1661, the president of the Court of Session was declared to have precedence of the lords register, advocate, and treasurer-depute; and, by a letter from queen Caroline, guardian of the kingdom in 1729, it was ordered that the president should have precedence of the chief baron of Exchequer, who was to rank before the other senators of the College of Justice, these and the barons of the Exchequer ranking together indiscriminately according to the date of their commissions, the precedence being given to the senator in case of the dates happening to be the same.

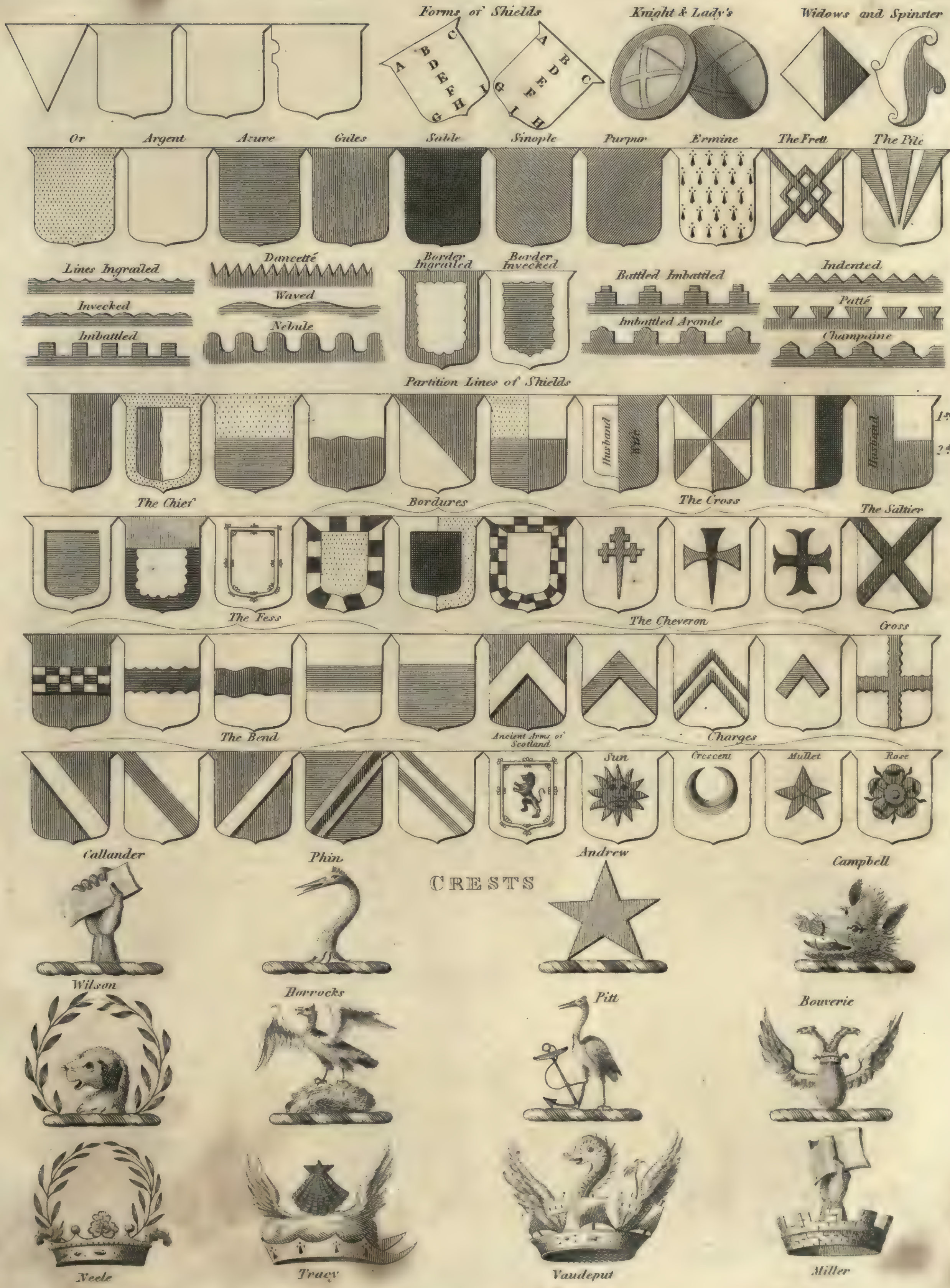
From all that has been said on this, by no means, unimportant matter, it will be perceived that there exists sufficient ground-work for disputation between certain of the official dignitaries and minor ranks; and, accordingly, it is well known that no small rankling occasionally arises among those who, whatever they might be disposed to concede as to merely private or personal honour, conceive themselves bound to maintain the right, real or supposed, of their respective orders. The reader will have observed that little notice has been taken of the clergy of Scotland in treating of precedence, the table taken from Nisbet bearing the only allusion to them, and this, admitting it to be an authority, besides that it merely relates to doctors of divinity, not determining their relation to military and naval officers and some other personages. Now, it is matter of fact that, a few years ago, there sprung up a controversy as to their proper place in one of the most remarkable ceremonies now exhibited in the kingdom of Scotland, that of the procession of the lord high commissioner to the church, which is not yet, it is believed, entirely and comfortably decided. It is not for this work to enter upon its merits, or deliver any dogmatic opinion on the claims of the parties interested; but we may perhaps be suffered with impunity to say that, whilst conceiving the procession to bear a particular reference to the church, of which they are the equal and main supporters and ministers, we think the clergy are entitled to take precedence of all who are not, from their official or hereditary dignity, essential to the consequence of the representative of his majesty, we are satisfied, on the other hand, that they will not, in any measure, compromise or lessen their real importance or respectability, if, as a body professing to have in view the superior glories of a heavenly kingdom, they deny themselves to the ambition of precedence in a fleeting pageantry.

HERAT, a city of Persia, and formerly the capital of Khorassin, is situated in a spacious well cultivated plain, covers an area of four square miles, is defended by walls and citadels, and, it is said, contains 100,000 inhabitants, composed of Afghans, Patans, and a small number of Hindoos, who retain the chief monopoly of its commercial transactions. Fruits are abundant in the vicinity, and roses are produced in such profusion as to suggest the appropriate appellation of the *city of roses*. The government of the town is vested in a son of the king of Cabul, and an annual tribute is paid to Persia. Herat may be considered as the emporium of trade between Persia on the one hand, and Cabul, Cashmere, and Hindostan on the other. Silks and drugs are exchanged for shawls, muslins, leather, and spices.

HERAULT, a department of France, having for its boundaries on the north and east the departments

HERALDRY

PLATE 99



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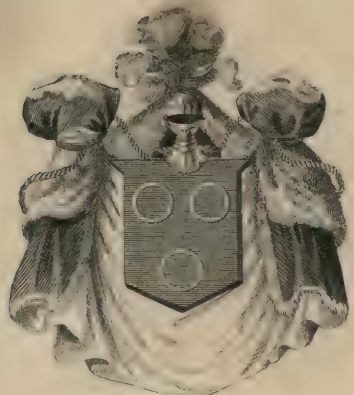
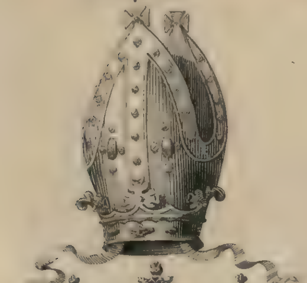
HERALDRY

Plate 100.

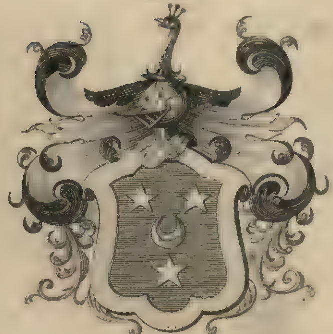
Knight



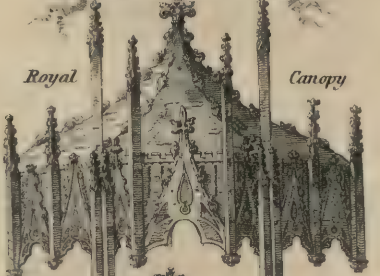
Bishops Mitre



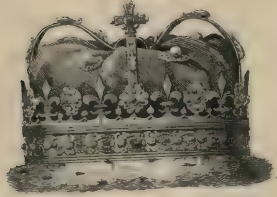
Esquire



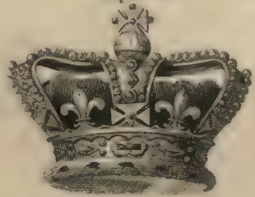
Royal Canopy



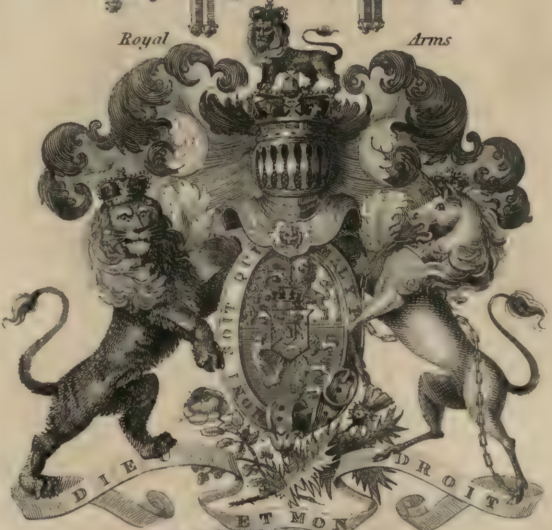
Scotland



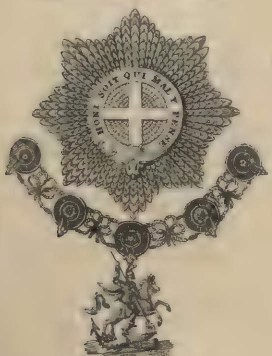
England



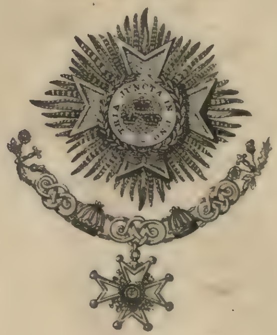
Royal Arms


HONI SOIT QUI MAL Y PENSE
DIEU ET MON DROIT

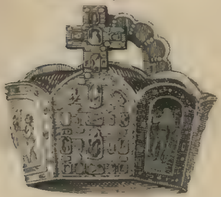
Star & Order of the Garter


HONI SOIT QUI MAL Y PENSE

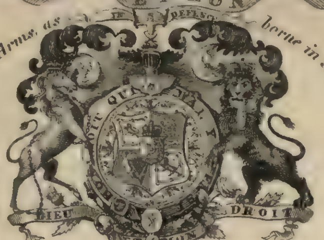
Star & Order of the Thistle



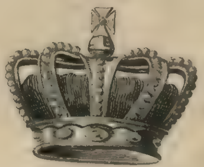
Charlemagne

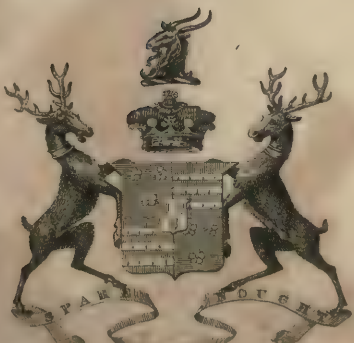


Royal Arms, as borne in Scotland

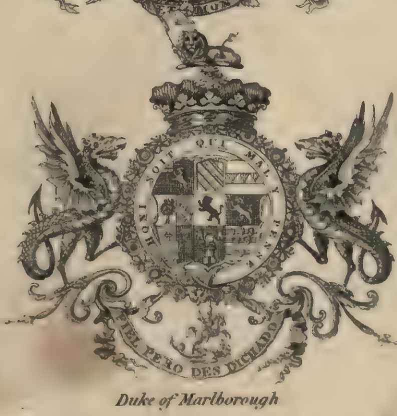


France

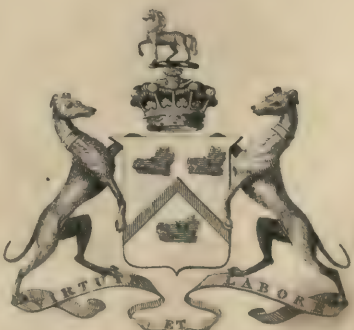




Marquis


HONI SOIT QUI MAL Y PENSE
FIEL PERO DESDICHADO

Duke of Marlborough



Earl

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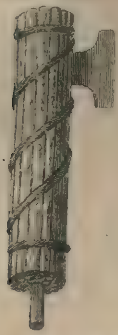
HERALDRY

PLATE 101.

FLAGS.

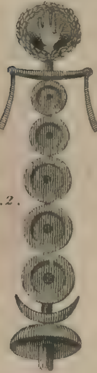
Roman Fasces

Fig. 1.



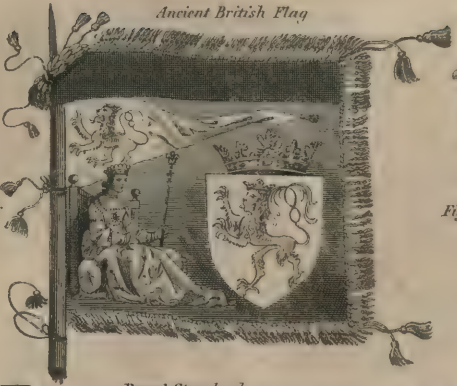
Ensign of Concord

Fig. 2.



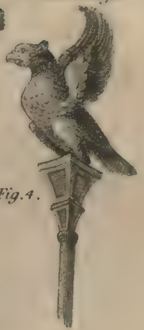
Ancient British Flag

Fig. 3.



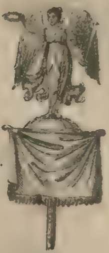
Roman Eagle

Fig. 4.



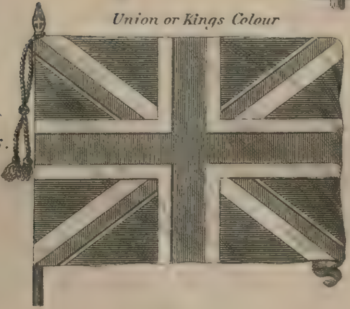
Ensign of Victory

Fig. 5.



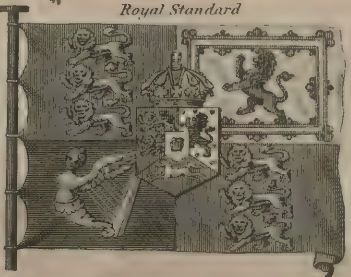
Union or Kings Colour

Fig. 6.



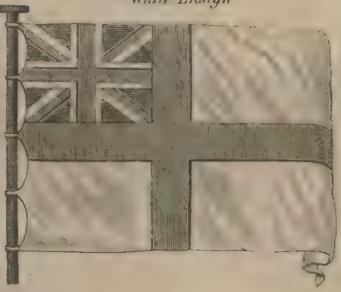
Royal Standard

Fig. 7.



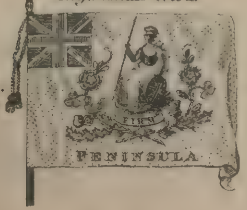
White Ensign

Fig. 8.



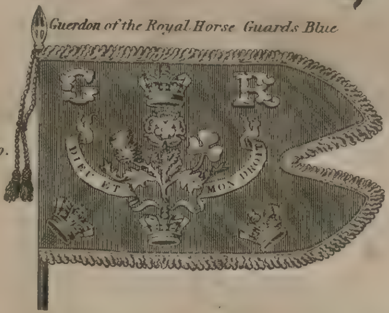
Regimental Colour

Fig. 9.



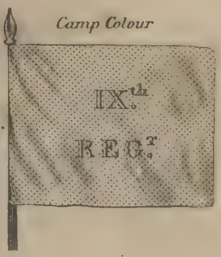
Guerdon of the Royal Horse Guards Blue

Fig. 10.



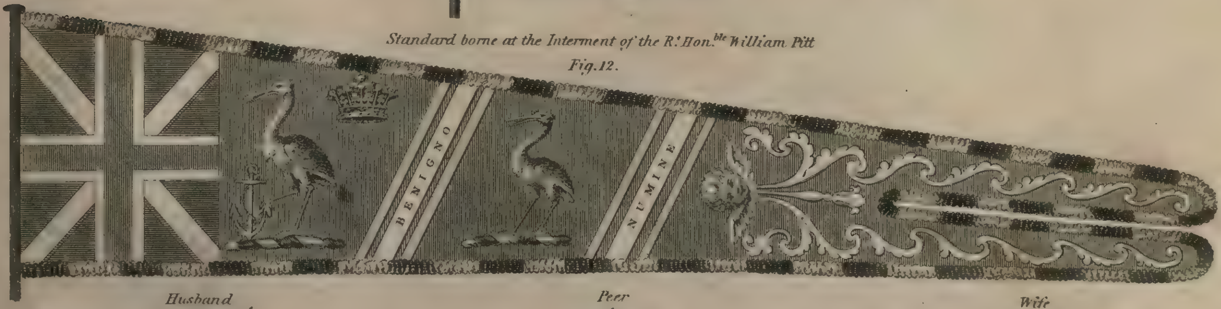
Camp Colour

Fig. 11.



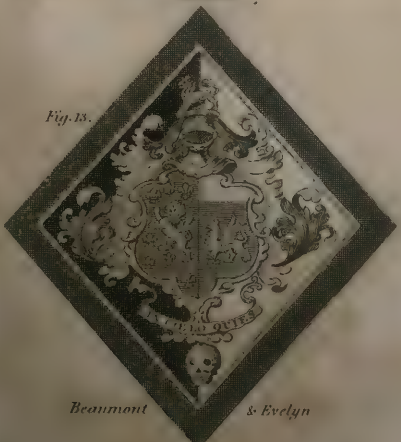
Standard borne at the Interment of the Rt. Honble William Pitt

Fig. 12.



Husband

Fig. 13.

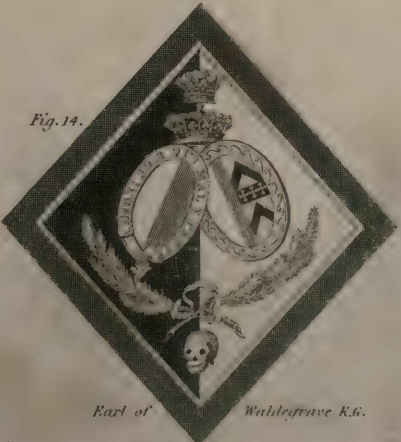


Beaumont & Evelyn

Wife Surviving

Peer

Fig. 14.

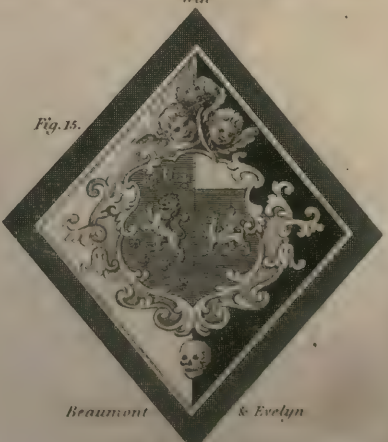


Earl of Waldegrave K.G.

Wife Surviving

Wife

Fig. 15.



Beaumont & Evelyn

Husband Surviving

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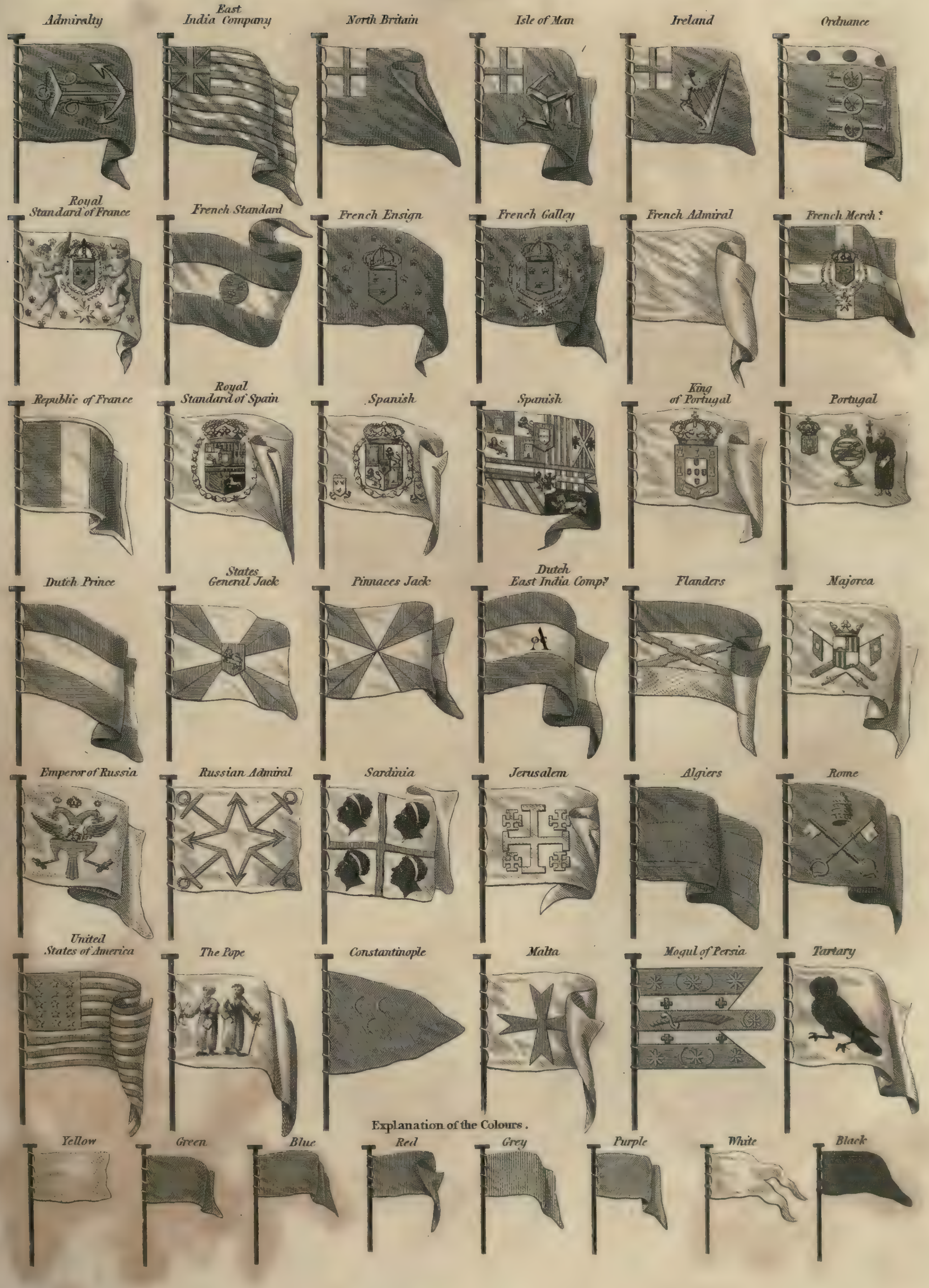
HERALDRY

FLAGS.



of Aveyron and Gard, and on the south and west the Mediterranean sea and the departments of Aude and Tarn, derives its name from the Herault, the principal river by which it is traversed from north to south, is finely diversified with hills, vallies, and plains, and produces every kind of grain, as well as abundance of fruits and silk. The Orbe is the only other river of importance. The canal of the South runs through the department, and affords great facilities to trade. The population is stated at 292,000; and verdegris, salt, wines, and brandy, are enumerated among the manufactures which employ the industry of the inhabitants.

Montpellier, the capital of the department, stands on a rising ground about three leagues distant from the shores of the Mediterranean, and has been long celebrated for its salubrious climate. The streets are narrow, but many of the houses are well built. The vicinity of Montpellier furnishes some of the sublimest and most extensive prospects; for while the Alps and Pyrenées are seen in clear weather on one side, the expanse of the Mediterranean stretches to the southward on the other. The town is supplied with water by means of a fine aquæduct, constructed with a double range of arches. The university was founded in the twelfth century, and the academy of sciences was instituted in the year 1706. The population is estimated at 34,000; manufactures of silk and woollen stuffs have been established; and the trade in oil, cordials, and wines is extensive.

Beziers, the principal place of a district, is situated on the banks of the Orbe, and at no great distance from the great canal, is surrounded with walls, and has a college, several religious houses, and an academy of sciences. The number of inhabitants is stated at 4000; and the principal manufactures are cloth, silk stuffs, and brandy.

Lodeve, which is also the principal place of a district, is 21 miles north from Beziers, and 24 miles west from Montpellier, and contains about 8000 inhabitants.

St Pons de Thomieres is likewise the principal place of a district, is 48 miles west from Montpellier, and numbers about 5000 inhabitants.

HERB, in the Linnæan language of botany, is that part of a plant which rises from the root, and terminates in the fructification, and therefore includes the trunk, stalk or stem, leaves, and buds; and *herbaceous* plants are such as have succulent stems or stalks, which annually die down to the ground.

HERBAL either denotes a book which treats of the arrangement, description, and virtues of plants, or is used to signify a collection of dried plants, otherwise called a *Hortus siccus.*

HERBELOT, Bartholomew D', an eminent French author, distinguished for his oriental literature, was born in Paris in 1625, and died in 1695. To enable him to prosecute the studies to which he was by inclination so strongly attached, he enjoyed a pension from government; he was appointed secretary and interpreter of the oriental languages, and professor of the Syriac tongue; and his principal work, *Bibliotheque Orientale*, first written in Arabic, and afterwards translated into French, bears ample testimony of his profound erudition.

HERBERT of Cherbury, Edward, Lord, an English author, and singular character for his romantic and chivalrous notions, was descended from an ancient family, and was born at the castle of Montgomery in Wales in 1581; was educated at Oxford, and soon after the accession of James I. was created a knight of the Bath. He was employed both in military and diplomatic affairs; and often, guided by the extravagance of chivalry, he was not slow in engaging in private quarrels, and challenging the offending party; but it is observed, that almost all his challenges came to nothing. For his diplomatic services he was created an English baron, and in the latter period of his life he seems to have retired from public affairs. In the time of the civil wars, he joined the popular party, but without any active share in the disastrous struggle which followed. He died in 1648.

The famous work of Lord Herbert of Cherbury, *De Veritate*, in which he attempts to shew the sufficiency, universality, and absolute perfection of natural religion, with the view of proving that revelation is unnecessary or useless, is distinguished for learning and argumentation; he was the author of the History of the Life and Reign of Henry VIII; but his Memoirs, which were first printed by Mr Walpole in 1764, is perhaps not the least entertaining of his writings; and while they exhibit the frankness, bravery, and generosity of his character, they shew him to have been vain, fanciful, boastful, and punctilious.

HERCULANEUM, an ancient city of Italy, which was destroyed by an eruption of Vesuvius in the 79th year of the Christian era, and was discovered in 1711 by the digging of a well, since which time excavations have been made into the streets; and temples, theatres, and other public edifices have been discovered; statues, pictures, utensils of various kinds, and manuscripts, have been dug out of the ruins; and of the spoils that have been found in the buried city, a museum has been formed, under the patronage of the king of Naples, at whose expense the operations were conducted. See Naples.

HERCULES, one of the most celebrated heroes of the fabulous history of the Greeks, was ranked among the gods, and received divine honours. Several personages of the same name and character are mentioned by ancient authors; but the Theban Hercules holds the most conspicuous place. He is said to have been the son of Jupiter by Alcmena, the wife of Amphitryon, king of Thebes. When Hercules grew up to manhood, he became famous for the most daring exploits, among which are enumerated the destruction of the Nemæan lion, of the Lernean hydra, of the stag with the golden horns and brazen feet, of the Erymanthian boar, of the horses of Diomedes which fed on human flesh, and of others, denominated from their number the twelve labours of Hercules. The period when Hercules flourished was in the 13th century before the Christian era.

HERCULES' PILLARS are the promontories of Europe and Asia, which form the straits of Gibraltar, called by the ancients *Abyla* and *Calpe*, Herefordshire.

and were supposed to be the boundaries of the labours of Hercules, by whom, according to the fable, the communication between the Atlantic and Mediterranean seas was formed.

HEREFORDSHIRE, a county of England, nearly of a circular form, is bounded on the east by Worcestershire, on the south by Monmouthshire and Gloucestershire, on the west by Radnorshire and Brecknockshire, and on the north by Shropshire; extends about 30 miles from north to south, and 35 miles from east to west, and is said to include an area of 800,000 acres.

Aspect.--The county is agreeably diversified with hill and dale, and commands from the eminences interesting prospects of gentlemens' seats, villages, orchards, corn-fields, meadows, and plantations. Great part of the county is inclosed with hedge-rows, and the roads, formerly extremely bad, have been greatly improved.

Rivers.—The Wye, the Lugg, the Munnow, the Arrow, the Frome, the Leddon, and the Teem, are the principal rivers. The Wye, celebrated for its picturesque beauties, rises in Montgomeryshire, and enters the county near Clifford; the Lugg originates in Radnorshire, enters the county near Stapleton castle, and being joined by the Pinsley, the Arrow, and the Frome, falls into the Wye near Mordisford; the Munnow rises in the Hatterel mountains, is joined in its course by several streams, and forms the boundary between Monmouthshire and Herefordshire; the Arrow flows from Radnorshire, and falls into the Lugg; the Frome rises near Wolfrelow, and joins the Lugg above Mordisford; the Team enters the county from Radnorshire and Shropshire, and falls into the Severn in Worcestershire; and the Leddon rises above Bosbury, flows towards Gloucestershire, and unites with the Severn.

Natural History.—Some mineral springs in the Malvern hills are known by the name of *Holy wells.* The Bone-well, near Richard's castle, is so called from its emitting small bones; and petrifying springs are in the Moccas, Founhope, Laurethal, and Wormesly hills.

The soil of Herefordshire is a mixture of marl, clay, and calcareous earth. Great part of the lands are under tillage, the farms are extensive, and wheat, oats, and turnips are abundantly grown. The breeds of cattle, sheep, and hogs are excellent; and the county is much celebrated for the production of fine wool. Cheese is the principal produce of the dairy. Herefordshire may be considered a woodland county. Various species of trees, some of which grow spontaneously, thrive well, and the plantations are very extensive. Orchards vary in size from 30 to 40 acres, and are extremely fruitful. The manufacture of cyder and perry is very considerable, and great quantities are sent to London and Bristol, and thence to Ireland and the East and West Indies. The cultivation of hops is also successfully practised.

Population.—Herefordshire is divided into eleven hundreds, which include 221 parishes, one city, and six market towns; and in 1811 the population was estimated at 94,073. Eight representatives are sent to parliament.

Herefordshire.

The Herefordshire beacon, on the summit of one of the Malvern hills, is one of the grandest fortresses in Britain, and as a strong hold is peculiarly worthy of notice; and many remains of ancient castles are in the county. The cascade of the New Weir on the river Wye is remarkable as a picturesque object; and Ross or Bury-hill, about three miles from Ross, is celebrated as the supposed site of the ancient Roman *Ariconium.*

Hereford, the county town, is situated on the river Wye, which has a spacious bridge over it. The cathedral, bishop's palace, college, shire-hall, theatre, gaol, and some hospitals, are the principal buildings. The see of Hereford includes Herefordshire and part of Shropshire. The population in 1811 amounted to 7306, and the manufacture of gloves is very considerable. Cyder, grain, and oak bark are conveyed down the Wye, and through the same channel the city is supplied with coals from the forest of Dean.

Ross stands on an elevated spot on the river Wye, and, on account of the situation and fine prospects, is much resorted to. The church is a spacious building, with a tower and spire. The population is between 2000 and 3000.

This town has acquired additional importance as the residence of John Kyrle, the celebrated *Man of Ross,* whose benevolence and charities are so finely depicted in the glowing numbers of Pope in his "Moral Essays." This unwearied philanthropist was a native of Gloucester, and died in 1724, when he had reached the 90th year of his age. The house in which he resided is now the King's-arms inn, near the entrance of the town from Gloucester; but the memory of his good deeds still lives in the traditionary history of the place; although many of his improvements, for the comfort, the health, and the pleasure of the inhabitants have been neglected.

"Who taught that heaven directed spire to rise?
The *Man of Ross*, each lisping babe replies.
Behold the market-place, with poor o'erspread!
The *Man of Ross* divides the weekly bread.
He feeds yon alms-house, neat, but void of state,
Where age and want sit smiling at the gate.
His portioned maids, apprenticed orphans blest,
The young who labour, and the old who rest.
Is any sick? The *Man of Ross* relieves,
Prescribes, attends, the med'cine makes and gives.
Is there a variance? Enter but his door,
Balk'd are the courts, and contest is no more."

Kington, a market-town, situated under Bradnor mountain, has a church and free school, and the population in 1801 was 1424.

Leominster, situated in a fruitful valley near the river Lugg, is a thriving town, and much noted for fine wool, and the manufacture of cyder; and contains a church, a town-hall, some charitable institutions, and a new market-place. The population is about 3000.

Weobley, also a market-town, contains a spacious church, and in 1801 the population was 608.

Bromyard is an irregular town, with a population of nearly 1000.

Ledbury, situated about a mile from the river Leddon, contains two principal streets, a spacious church, an hospital, and free school; and the population is estimated at more than 3000.

HERMANN, Paul, a botanist of some celebrity, was a native of Halle in Saxony; and having practised medicine in the island of Ceylon and at the Cape of Good Hope, was appointed, about the year 1679, professor of botany at Leyden. He died in 1695. His first work was a catalogue of the plants in the botanical garden of Leyden, which, during his superintendence, was so much improved and enlarged, that it rivalled the first in Europe. He was the author of a systematic classification of plants, beside some other works; and the drawings which he left behind him furnished the materials for the *Flora Ceylonica* of Linnæus. He was also the author of a catalogue of objects relating to natural history from India, including animals, insects, vegetables, and minerals, as well as a catalogue of plants of the Cape of Good Hope.

HERMANNIA, a genus of plants belonging to the Monadelphia class.

HERMES, or Mercury, known under the name of Thoth among the Egyptians, is an appellation applied to two celebrated characters, who were distinguished as legislators, priests, and philosophers, who either invented or greatly improved the arts and sciences. The first Hermes, or Thoth, was the counsellor and friend of Osiris, and he improved language, invented letters, and taught astronomy, music, and other arts. It is supposed that he lived before the time of Moses; and, indeed, is by some identified with the Jewish legislator. The second Hermes, no less celebrated, and distinguished by the sirname of *Trismegistus,* lived at a later period, and revived geometry, arithmetic, and the arts, which had been lost or neglected among the Egyptians. He was the author, according to some ancient writers, of a prodigious number of books, as Commentaries upon the Tables or Symbolical Inscriptions of the first Hermes, which treated of celestial beings, of astrology, medicine, and other subjects.

HERMETIC, or Hermetical Art, is one of the older appellations of chemistry, founded on the supposition that it was invented by *Hermes Trismegistus*; and hermetical philosophy is applied to that system which explains the phenomena of nature from the three chemical principles, salt, sulphur, and mercury.

HERMOPOLIS, the name of several ancient cities in Egypt, dedicated to Hermes, or Mercury; and near one of these cities, supposed to be the Great Hermopolis, the portico of a magnificent temple, visited by Denon in 1799, still remains, and is described as a splendid monument of ancient architecture. Every part of the edifice is covered with hieroglyphics, and enormous blocks of stone are either scattered around or buried in the sand. Connected with the fragments of the great temple a mosque has been erected, in which numerous columns of Cipoline marble are seen. Near the ruin is the town of Achmim, which contains 5000 inhabitants. See Achmim.

HERNANDIA, Jack in a Box-tree, a genus of plants belonging to the Monœcia class, and of which *hernandia sonora,* a native of the West Indies, from the peculiar whistling sound produced by the wind passing through the hollow seed-pod, furnishes the trivial name. See Botany.

HERNIARIA, Rupture Wort, a genus of plants belonging to the Pentandria class.

HEROD, sirnamed The Great, a king of the Jews, was the second son of Antipater the Idumæan, and was born about 71 years before the Christian era. While a young man, he was appointed by his father governor of Galilee, and, by his vigorous measures, suppressed a formidable band of robbers. In the civil war between the republican and Cæsarean parties he joined Cassius. When Mark Antony, in his victorious career, arrived in Syria, Herod and his brother obtained his favour, and the appointment of governors of Judea, in the character of tetrachs; but, on the invasion of Jerusalem by Antigonus, he was compelled to make his escape, and, having reached Rome, was nominated by the senate king of Judea. With the assistance of a Roman army, and after a siege of six months, he became master of Jerusalem, and his rival Antigonus was taken prisoner. Being established on the throne, his first concern was to improve his revenues, which he effected by extortion and severity; and, in consequence of the suspicion and jealousy that existed between him and his mother-in-law, and finally extended to his wife Mariamne, he was summoned to appear before the triumvir. He was again successful in making his peace with Antony, and returned in great favour. But the quarrels and jealousies that prevailed in his family still embroiled and embittered his life.

In the war between Antony and Octavius, Herod raised an army with the view of joining the former, but he was obliged first to engage with Malchus, a king in Arabia, whom he defeated; after the battle of Actium, his chief object was to make terms with the victor; for this purpose he appeared before Augustus at Rhodes in his royal robes, with the exception of his diadem, which, after hearing his services detailed, and being struck with his magnanimous defence, Augustus replaced on his head; and when the Roman emperor made a progress through Syria he was entertained by Herod with the utmost magnificence, and by this means his revenues and dominions were restored and enlarged. But this good fortune was more than outweighed by the distractions and jealousies that still prevailed between him and Mariamne, against whom his resentment increased so much that she was brought to trial, condemned, and executed, while every hour of her husband's future life rendered him the prey of unceasing and bitter remorse. The luxury and splendour in which he lived, and the busy scenes in which he was engaged while he was erecting the most magnificent edifices, could not banish her from his mind. At Jerusalem he built a stately theatre and amphitheatre, in which games were exhibited after the manner of the Romans; he lavished great sums in palaces and fortresses, and rebuilt and adorned Samaria; and, to gain popularity among his countrymen, he undertook and accomplished the magnificent enterprise of repairing the temple of Jerusalem.

The two sons of Herod by the first Mariamne, for he had married a second of the same name, having been educated at Rome, on their return to Judea soon acquired great popularity on account of their manners and accomplishments, and at the same time excited the jealousy of their father. The enmity thus begun increased, and at last proved fatal to the young men, who were tried, condemned, and put to death. The birth of Jesus Christ took place in the 33d year of Herod's reign, and it was soon followed by the massacre of the children at Bethlehem, to which he was prompted by jealousy of the king of the Jews, whose birth was announced to him by the magi. This event is only recorded by the evangelist Matthew. A new source of jealousy sprung up on the return of his son Antipater from Rome, who was charged with treason, and being tried before the Roman governor of Syria, was found guilty of conspiring against his father's life. In the midst of these calamities, which it may be easily imagined were in no small degree aggravated by the upbraidings of a guilty conscience, Herod was seized with a mortal disease, which was accompanied with loathsome symptoms; and finding his end approaching, he planned, according to Josephus, one of the most barbarous scenes of posthumous cruelty that could have been conceived by the most depraved heart. Having summoned the chief persons among the Jews to Jericho, he caused them to be shut up in the circus, and gave strict orders to his sister Salome to have them all massacred when he drew his last breath; but, although she had often infused suspicion into his mind, and seems to have been a convenient instrument in his hand in the perpetration of many of his cruelties, her prudence or humanity on this occasion prevented the execution of this horrid plan. He died in the 68th year of his age, and four years before the Christian era.

HEROD, Antipas, the son of Herod the Great, who, on his father's death, succeeded to the possession of the greater part of Galilee and the countries beyond Jordan. See Antipas.

HERODIAN, a Greek historian, who flourished from the reign of Commodus to that of the third Gordian, and is supposed to have been employed in different public offices at Rome. Herodian's history of the Roman Emperors commences at the death of Marcus Antoninus, and is continued to the accession of Gordian III. It includes a period of nearly 70 years, and is divided into eight books. This work is translated into Latin by Angelus Politianus; and one of the best editions was published at Oxford in 1708.

HERODOTUS, the oldest of the Greek historians whose works are extant, and styled by Cicero the *Father of History*, was born at Halicarnassus in Caria, about 484 years before the Christian era. He travelled in Greece and Egypt in pursuit of knowledge, composed his history, it is supposed, during his retirement in the island of Samos, and acquired great celebrity by the public recitation of some part of it at the Olympic games. The history of Herodotus is divided into nine books, which are distinguished by the names of the nine muses. It includes a period of about 240 years, extending from the time of Cyrus the Great to Xerxes; and, beside a sketch of the affairs of other nations, contains a detail of the transactions between Greece and Persia. The history is written in the Ionic dialect, and its style has been always admired for its ease and sweetness. In his narrative of remote events, Herodotus is charged with relating fabulous stories, although, by those who are disposed to defend his authority, it is said he merely states what he has heard, without any assertion of the truth of the narration. The English reader has an opportunity of perusing the works of this ancient historian in two translations, one of which was executed by Littlebury and the other by Beloe. The death of Herodotus is supposed to have happened 413 years before the Christian era.

HERRERA, Tordesillas Antony, a Spanish historian, was born in 1565, and after having been secretary to the viceroy of Navarre and of Valentia, was appointed by Philip II. royal historiographer for the Indies, and in this capacity he wrote his general history of the Indies, in four volumes folio, in which are related all the transactions of the Spaniards in the New World, from 1492 to 1554. This work is characterised by Dr Robertson as furnishing the fullest and most accurate information concerning the conquest of Mexico, as well as every other transaction of America; and, while it exhibits great industry and attention in the collection of materials, it is not less conspicuous for impartiality and candour in forming a just estimate of the evidence of the facts and motives which come under consideration. Herrera was also the author of a general history of his own time; and he died in 1625.

HERRING, the Clupea Harengus of Linnæus, is supposed to be derived from the German word signifying an army, expressive of the immense shoals of that valuable fish that appear in the seas which they frequent. For the classification of the herring, see Ichthyology; and for an account of the fishing and curing of herrings, see Fisheries.

HERRNHUT, the first settlement of the united or Moravian brethren, is a place in Upper Lusatia, and about 50 miles east from Dresden. It was originally assigned by count Zinzendorf to the emigrants from Moravia, who forsook their native possessions on account of the persecution which they suffered as Protestants. The spot allotted to them is upon the declivity of a hill called the Hutberg or Watch hill; and hence the new settlement was denominated Herrnhut, or the watch of the Lord. In the course of a few years it became a regular and well built village, containing 1300 inhabitants, all members of the church of the united brethren. On one side of the square in which the chapel stands, is a large building inhabited by the single men, with the work-shops, outhouses, and gardens; each inhabitant contributes a moderate sum for rent and board: and on the other side of the square, a similar building is appropriated to single women, and is under similar regulations. The family houses are built in regular streets which open into the square. Charitable institutions have been formed; all strangers are treated with civility, but no disorderly visitors or beggars are suffered to infest the streets. The principal trade at Herrnhut is in linen; and the excellent work executed by various artificers, as cabinetmakers, silversmiths, shoemakers, and glovers, has been long known. Every individual workman receives wages for his labour, for no community of goods exists among the brethren, as has been supposed; and all the contributions for the support of the establishment of missions and of charitable institutions, are voluntary. The missions sent out from the original establishment to different parts of the world, and particularly to some of the most inhospitable regions of the globe, have been productive of much benefit, not only by communicating the blessings of religion, but by instructing the barbarous nations in many of the useful arts of civilized life.

HERTFORDSHIRE, a county of England, bounded on the east by Essex, on the west by Bedfordshire and Buckinghamshire, on the north by Cambridgeshire, and on the south by Middlesex, is about 36 miles in length and 26 miles in breadth, and includes an area of 385,000 acres.

Aspect.—The county presents a very agreeable aspect; and the eminences, which are greatest to the northward, though not much elevated, command extensive prospects of beautiful scenery. The grounds are inclosed with fine hedge-rows.

Rivers, &c.—The Lêa, the Rib, the Quin, the Beane, the Gade, the Colne, the Ver or Meuse, and the Mimeram or Maran, are the principal rivers. The Lea enters the county at Hide-mill, quits it near Waltham abbey, and is navigable to Hertford and Ware; the Rib rises near Cornybury, is joined by the Quin at Braughing, and falls into the Lea between Hertford and Ware; the Beane rises near Cromar, and joins the Lea at Hertford; the Gade originates on the borders of Buckinghamshire, and falls into the Colne; the Colne is formed of several streams which unite near North Mims, and flow towards Middlesex; the Ver or Meuse rises in Bedfordshire, and unites with the Colne; and the Mimeram or Maran, flows from the vicinity of King's Walden, and falls into the Lea at Hertford. Besides these, a number of smaller streams traverse the county.

The Grand Junction Canal enters the county from Middlesex, and flows to Buckinghamshire; and another canal was projected, but did not succeed.

Some chalybeate springs are in the southern parts of the county, and in the northern part some incrustating springs have been observed.

Husbandry, &c.—The climate of Hertfordshire is favourable, and the principal soils are clay and loam; and owing to the natural advantages, and the vicinity to the capital, the landed property is greatly divided among wealthy inhabitants. The largest estate is worth about L.7000 a-year; and freehold estates have been sold at from twenty-five to thirty-two years purchase. Some of the farms are under the direction of the noblemen to whom they belong; and the marchioness of Salisbury, some years ago, inclosed about 17 acres of ground at Hatfield, for the laudable purpose of agricultural improvement.

The county is favourable for the growing of corn, and the greater part of it is under tillage. Great attention is paid to the management of proper manures; among which, chalk, burnt bones, woollen rags, and various other substances, are appropriated. The farms extend from 150 to 400 acres, and a few contain from 800 to 1000 acres. The principal agricultural implements in use are the Hertfordshire wheel-plough, worked by three or four horses, the Hereford plough, the swing-plough, the skim-coulter, and the threshing mill. In some estates the plough is drawn by oxen, which are sometimes shod.

The rotation of crops is most generally turnips, barley, clover, wheat, and oats; but these are varied according to the nature of the soil. The produce of wheat, barley, and oats, is very abundant; and clover, saint-foin, rye-grass, and tares, together with potatoes and cabbages, are plentifully grown. The grass lands are extensive, and the meadows are productive.

The county abounds in woods and copses; and oak, beech, and elm, are extensively grown. The orchards are numerous, and productive of apples and cherries.

The breeds of cattle in Hertfordshire are the Welsh, Devon, Suffolk, and Hereford, of which the Suffolk is preferred. The horses are of various kinds; and the breeds of sheep are Southdown and Wiltshire, and a breed between the Cotswold and Leicester.

Population.—Hertfordshire is divided into eight hundreds, containing 17 market-towns, and about 134 parishes; and the population in 1811 amounted to 111,654. The county sends six representatives to parliament.

Manufactures.—Silk, cotton, and paper-mills are established in different parts of the county; considerable quantities of malt are made and conveyed to the metropolis; and the making of thread-lace, and plaiting of straw for bonnets, occupy the industry of great numbers of women and children.

Antiquities.—The most interesting objects of antiquity in Hertfordshire are, the abbey of St Albans, a Gothic pile, on the site of the ancient Verulam; St Michael's church, in the vicinity, in which lord Bacon's remains were interred, and where his monument still remains; the Roman camp at Ravensborough; the cross at Waltham, and several castles.

Hertford is an ancient town, situated on the river Lea, and principally remarkable for a college of the East India Company, established in 1806, where young men are educated for the purpose of filling offices in the civil departments in India; and in consideration of the very important stations for which the students at this establishment are designed, no pains are spared in advancing their intellectual improvement. The principal subjects taught are oriental literature, mathematics, natural philosophy, classical and general literature, law, history, and political economy; and a school is also established for the purpose of qualifying youth for public business, and for entering upon the studies of the college. A good grammar school has been long established; and the Blue-coat school, connected with Christ's hospital, accommodates above 500 children. Hertford had formerly five churches, only two of which now remain. The ancient castle is in ruins, except the apartments fitted up for the use of the college. The walls are surrounded by a deep moat, supplied with water

Hertfordshire.

from the Lea, and the inclosed area is formed into a garden. Hertford has enjoyed many privileges from different sovereigns, and is now governed by a mayor, recorder, ten aldermen, a chamberlain, and others. The population in 1811 was 3900.

St Albans is an ancient town, 21 miles from London, and containing about 4000 inhabitants. See Albans, St.

Hitchin, situated in a fertile valley, consists of several streets, and contains a handsome church, and a market for corn and grain, which has long existed. The population is about 3600.

Ware is an ancient town, on the west side of the river Lea, contains a spacious church, and some alms-houses, and has a considerable trade in malt and corn. The population is stated at 3369.

Hemel-Hempsted, a market town, situated on an eminence near the river Gade, contains an ancient church, and a market-house, where considerable quantities of corn are disposed of; and the Grand Junction Canal is beneficial to the prosperity of the town. The population is 3240.

Rickmansworth is a small town near the rivers Gade and Colne, has a spacious church, and, from the abundance of water, various mills are erected in the neighbourhood. The trade in corn, which was formerly considerable, has declined. The manufacture of straw-plait is carried on. The population is 3230.

Hatfield, or *Bishops Hatfield*, so called from a palace belonging to the bishops of Ely, contains a handsome church, and some alms-houses, and the population is 2677.

Bishops Stortford, situated on the river Stort, contains a church, a grammar-school, a spacious market place, and some good inns, and the canal is favourable to trade. The ruins of an ancient castle are situated on the east side of the town. The population is 2630. About five miles from this town is situated the ancient village of Sawbridgeworth, with a population of about 1700.

Watford contains many respectable buildings, a spacious church, a free school, and three silk-mills, the largest of which is worked by the waters of the Colne. The population is 2600; and the labouring classes are employed principally in agriculture.

Berkhamsted consists of one principal street, contains many handsome houses, a church built in the form of a cross with a tower, a free school, a charity school, and an alms-house. The ruins of a castle are situated on the east side of the town. The population is about 2000.

Standon is an ancient town with a population of about 1900. The church is adorned with numerous sepulchral monuments.

Tring is a small irregular town in the north-western part of the county, contains a commodious church with a tower, four meeting-houses, a market-house, and a Sunday school. Straw-plait is the principal manufacture. The population is about 1900. Tring-park, in the vicinity, is an elegant seat, in the midst of 300 or 400 acres of fine plantations.

Baldock consists of one principal street, with some respectable buildings, and a spacious church. Considerable trade is carried on in corn and malt. The population is about 1500.

Royston, situated on the borders of the county and of Cambridgeshire, contains a church, a market-place, and a population of about 1300. A remarkable cave, which was discovered in 1422, is situated beneath the market-place.

Stevenage is a pleasant village situated on the high north road, and contains a population of about 1300. At a little distance from Stevenage are six barrows or tumuli, supposed to be of Danish origin.

Hoddesdon is a small town situated near the river Lea, contains a market-house, near which is a conduit of good water. The population is about 1300.

Waltham Cross is a small town situated on the west side of the river Lea, and so called from a cross erected by Edward I. It has a small market-house, and the population is about 1150.

Barnet, or *Chipping Barnet*, a market-town situated on the high road from London, and hence also called High Barnet, contains a church and two alms-houses, and the population is about 1300.

Hervey.

HERVEY, James, an English divine, and popular writer, was a native of Northamptonshire, and was born in 1713, received his classical education at Northampton, and passed through a course of academical study at Oxford. At that university he was not greatly distinguished for diligence and application, till he became intimately acquainted with that class of persons conspicuous by their zeal for primitive Christianity, and since denominated Methodists. Through their influence and example, his attachment to piety and learning was strengthened. Beside the requisite studies connected with his professional views, he made considerable proficiency in various departments of natural philosophy; and he carefully perused Spence's Essay on the Odyssey of Pope to improve himself in style and composition. Having entered into holy orders, he was first settled in a curacy in Hampshire, afterwards in Devonshire, and finally in 1743 at Weston Favell in Northamptonshire, of which parish his father was incumbent. After a residence of two years in London on account of his health, he was recalled in consequence of his father's death, and continued in the faithful discharge of his ministerial duties till the year 1758, when exhausted by an insidious disease he died on Christmas day.

Mr Hervey was not more zealous in promoting the spiritual comfort of his flock by his pious and indefatigable labours, than in contributing by his beneficence to relieve their temporal wants. The profits of his "Meditations," amounting to L.700, were devoted to charitable purposes. Few readers are unacquainted with the works of Hervey; and although the fastidious critic may be disposed to censure the style and composition, the ardent piety which they breathe, and the excellent moral reflections with which they are interspersed, have acquired for them very general admiration, and a high degree of popularity. His principal works are, "Meditations and Contemplations, containing Meditations among the Tombs, Reflections in a Flower Garden, and a Descant on Creation;" "Contemplations on the Night and the Starry Heavens, and a Winter piece;"

"Theron and Aspasio, or Letters and Dialogues on Important Subjects;" "Letters;" and "Sermons."

HESIOD, an ancient Greek poet, who is supposed by some to have been contemporary with Homer, and by others to have lived a century later, was a native of Æolia, but in early life removed to Ascra in Bœotia, whence he is called the Ascrean bard. His chief work is entitled "Works and Days," which is a kind of kalendar of rural occupations; the "Theogony" of the same poet, is a system of theology, and exhibits a view of ancient mythology; and the "Shield of Hercules," more distinguished for its poetry, is doubtfully ascribed to him. The best editions of Hesiod are those of Amsterdam 1657 and 1701, of Oxford 1737, and of Leipsic 1746 and 1778.

HESPER, or Hesperus, the evening star, an appellation of the planet Venus when she follows or sets after the sun.

HESPERIDES, according to ancient mythology, were the daughters of Hesper or Hesperus, whose daughter Hesperia married her uncle Atlas, and from this marriage proceeded seven daughters, called Hesperides from their mother, and Atlantides from their father. But the Hesperides are supposed by Hesiod to be the daughters of Night; and in the fable they are represented as the guardians of the Golden Apples which grew in the gardens of the Hesperides, the place of which is assigned by some to the western parts of Africa, by others to the Canary islands, and even by some to Sweden.

HESPERIS, Rocket, or Queen's Jilly-Flower, a genus of plants belonging to the Tetradynamia class, the double varieties of some species of which are well known to florists.

HESSE, a principality of Germany, included in the circle of the Upper Rhine, is bounded on the south and east by the bishoprick of Foulda and the principalities of Thuringia, Eichsfield, and Calenberg; and on the north and west by the bishoprick of Paderborn and Waldeck, Westphalia, the county of Witgenstein, Nassau-Dillenburg, and Upper Isenburg; is nearly 100 miles in length, varying much in breadth; is greatly diversified in its aspect, exhibiting mountains, valleys, plains, and woods; and is distinguished for the fertility of its soil, which produces abundance of corn, and affords excellent pasturage. The sides of the hills in many places are covered with vineyards, and different kinds of fruits are plentiful. Metallic ores are abundant in the more elevated regions, and mineral waters and salt springs are not unfrequent. This district is well watered by the Rhine, the Mayne, and some other streams.

Hesse is divided into Upper and Lower, and subdivided into five districts, which derive their names from rivers by which they are traversed. Marburg is the capital of Upper Hesse, and Cassel is the principal town of Lower Hesse. The sovereign authority of this country is established in two families, Hesse Cassel and Hesse Darmstadt, the former of which, when Germany was overrun by the French and parcelled out to their adherents, was annexed to the kingdom of Westphalia.

HESYCHIUS of Alexandria, the author of a Greek lexicon or vocabulary, is supposed to have flourished about the end of the sixth century, and, according to some, is the same person as the patriarch of Jerusalem of that name. The work alluded to is reckoned one of the most valuable treasures of the Greek language, and has been elucidated by the notes of learned critics. The best editions are those of Schrevelius, 4to, in 1668, and of Albert in 1746.

HESYCHIUS of Miletus flourished in the reign of the emperors Justin and Justinian, and was the author of an "Universal History," which includes the period from the reign of Belus to the death of Anastasius, and of some other works; an edition of which was published at Leyden in 1613.

HETEROSCII, a term in geography, applied to the inhabitants of the globe who live between the tropical and polar circles, and whose shadows always fall one way; as those in north latitude have their shadows always to the northward, and those in south latitude always to the southward.

HETRURIA, or ETRURIA, an ancient country of Italy, lying to the westward of the Tiber, and was originally divided into twelve different nations, each under its own sovereign. The inhabitants of this country were powerful enemies of the Romans, and were not subdued till after many severe struggles.

HEVELIUS, or HEVELKE, John, an eminent Polish astronomer, was a native of Dantzic, and was born in 1611, received a liberal education, and was destined to mercantile business; but a strong bias to mathematical studies precluded every other pursuit, and finally led him to the prosecution of the kindred subject of astronomy. He travelled through the different countries of Europe, and was every where received with esteem and respect by the learned. Hevelius was the first that observed the libration of the moon; he discovered several fixed stars, which he designated by the name of the *firmament of Sobieski*, in honour of the king of Poland; and in 1673 he published "Machina Celestis," or a description of the instruments which he employed in making his observations. The last-mentioned work was the ground of a violent controversy with the celebrated Robert Hooke, in which the Royal society took a part, and despatched Dr Halley to Dantzic to examine the instruments of the Polish philosopher. Hevelius was also the author of some other works, which were posthumous publications. He had been promoted to the office of burgomaster of Dantzic, and was held in great respect by his countrymen, both as a man of science and a magistrate. He died in 1687, when he had reached the 76th year of his age.

HEWSON, William, a distinguished anatomist, was born in 1739, and was first the assistant and afterwards the associate of Dr William Hunter in his public lectures. He died in 1774. He was the author of a treatise on the properties of the Blood and the Lymphatics.

HEXAMETER, in ancient poetry, a kind of verse consisting of six feet; the first four of which are either spondees or dactyls, the fifth is always a dactyl, and the sixth always a spondee.

HEXANDRIA, the sixth class of plants in the Linnean system of classification, including such as have flowers with six stamens of equal length. See Botany.

HEXAPLA is a word derived from the Greek, and applied to a bible arranged in six columns, containing the text and different versions. A work of this description was first compiled by Origen, for the purpose of correcting the sacred text and securing it from future corruptions. It was begun about the year 231, and, it is supposed, consisted of 50 large volumes, which perished with the library at Cæsarea.

HEXHAM, a town of Northumberland, near the confluence of the north and south Tyne, is a place of considerable antiquity, and was conspicuous for its magnificent cathedral and monastery, now in ruins.

HIBISCUS, Syrian Mallow, a genus of plants belonging to the Monadelphia class.

HIDALGO, an appellation given to all who are of noble descent among the Spaniards, and who trace their origin to the valiant soldiers who retired into Castile and the remote parts of Spain, when that country was invaded by the Moors. The noble hidalgos enjoyed many privileges and distinctions, among which are enumerated the right of holding all posts of dignity and honour in the church and state, and of being preferred in all embassies, governments, and public commissions.

HIERACIUM, Hawkweed, a genus of plants belonging to the Syngenesia class.

HIERAPOLIS, an ancient town of Phrygia, derives its name from the number of temples which were erected for the worship of the gods. Numerous hot springs, the waters of which are impregnated with lime, and deposit an earthy incrustation on plants and other bodies with which they come in contact, are found in the vicinity. This ancient city, the greater part of which is in ruins, is particularly described by Dr Chandler in his *Travels in Asia Minor*.

HIERARCHY, is a term denoting the whole establishment of a church, in which different ranks or degrees of the clergy exist, as in the church of Rome and the church of England.

HIERES, a town of the department of Var in France, was formerly celebrated as the sea-port town from which the pilgrims bound for the Holy Land embarked. The vicinity is famous for its fine gardens.

HIERES ISLANDS, a groupe of small islands in the Mediterranean, near the coast of France, and opposite to the town from which they derive their name.

HIEROGLYPHICS, derived from the Greek, and signifying *sacred sculpture*, are symbols or mystical characters employed in the writings and inscriptions of the Egyptians, and regarded as the emblems or signs of sacred or supernatural things. The invention of these symbols is ascribed to Hermes Trismegistus, and the knowledge of them seems to have been confined to kings and priests.

HIGHLANDS, a division of Scotland including the western districts from Argyleshire to Caithness, and the Hebrides or Western Islands. Many parts of this extensive tract are mountainous, and hence have given origin to the appellation in opposition to Lowlands, by which the other parts of Scotland are designated; hence the inhabitants are called Highlanders, among whom the Gaelic language is chiefly spoken.

HILDESHEIM is a district or bishoprick in the circle of Lower Saxony, between the duchies of Lunenburg and Brunswick, and during the French revolution was annexed to the kingdom of Westphalia. The length is about 40 miles and the breadth from north to south about 30 miles. Corn is produced in abundance in the greater part of the district, but the southern portion, which is hilly, is covered with excellent wood.

HILDESHEIM, the capital of the bishoprick of the same name, stands near the river Innersee, and consists of the old and new town. The greater part of the inhabitants belongs to the Lutheran church, but the see is under a Roman Catholic bishop, who possesses sovereign authority.

HILL, Aaron, an English poet and miscellaneous writer, was born in London in 1685, and was educated at Westminster school; but being totally unprovided for at his father's death, was compelled to quit that seminary at the age of 14. With an adventurous spirit, he undertook a voyage to Constantinople to visit his relative lord Paget, the English ambassador. After his return to England, he published, in 1709, a history of the Ottoman empire; and in the succeeding year was appointed manager of the Drury-lane theatre; soon after which he composed the tragedy of Elfrida and the opera of Rinaldo. His theatrical management seems to have been of short duration; for in 1713 he was engaged in a speculation of preparing sweet oil from beech nuts; and for this privilege a patent was obtained; in the same spirit of speculation he was concerned in the establishment of a plantation in Georgia; and at a later period of his life he visited Scotland, for the purpose of superintending the cutting of timber upon the estates of the York-building company in the Highlands, and floating it down the river Spey. But none of these projects seems to have proved beneficial to his private fortune. Beside the poem of Camillus, in honour of the earl of Peterborough, he composed another, entitled the Northern Star, which is a panegyric upon the czar Peter the Great, and brought him more substantial benefit than empty fame. He was also the author of the "Plain Dealer," a periodical paper; he was satirised by Pope in the Dunciad, and did not fail to retaliate in the "Progress of Wit." He translated and adapted for the English theatre, Zara, Alzira, and Merope of Voltaire; the first and the last of which are still occasionally brought forward. He died in 1750.

HILL, Sir John, a naturalist and multifarious writer, was born in 1716; was originally an apothecary, and, from his knowledge of botany, was engaged in the superintendence and arrangement of the botanical gardens of some of the nobility; and for the purpose of collecting rare plants, he travelled in different parts of the kingdom. He afterwards wrote, but unsuccessfully, for the stage; translated Theophrastus on Gems; and being refused admission into the Royal society, drew up a review of the works of that learned body, and succeeded in placing in a ludicrous light some of the investigations in their Transactions. He afterwards undertook a

Hill.

General History of Nature; was engaged in compiling a Supplement to Chamber's Dictionary, as well as in some other works connected with botany and other departments of natural history. Under the patronage of the earl of Bute, he undertook a huge work, entitled the "Vegetable System," which extended to 17 folio volumes; and having the management of the royal gardens at Kew, he published in 1768 "Hortus Kewensis." It is understood that he drew a large income from his numerous writings, and the emolument which he derived from his medical practice was also very considerable. But his whole life seems to have been a tissue of quackery; and yet he was raised to the degree of doctor of medicine by the university of St Andrews; and a copy of his botanical works being presented to the king of Sweden, procured for him from that sovereign the dignity of a knight of the Polar Star.

HINDOSTAN.

Introduction

HINDOSTAN, HINDOOSTAN, or HINDUSTAN, as it is variously written, is the name of a large country in the south-eastern quarter of Asia. The word is generally understood to be of Persian origin; but its meaning has been variously assigned, and the differences on the subject are necessarily connected with the opinions and statements respecting the size and limits of the region so called. Thus, it is said by some to be composed of *tan* or *stan*, signifying a country, and *Indus* or *Sindh*, the name of the great river on the western side; by others it is deduced from the same terminational adjunct and the word *Hindoo* or *Hindu*, denoting a peculiar people, and thus implies the *country* or *land of the Hindoos*; whilst a recent author, Mr Hamilton, who has written largely on the subject, deduces the name from the words *Hindoo, black*, and *st'han, place*.

The determination of the extent of the region thus denominated, presents more difficulty and greater embarrassment than this etymological question.

The ancients, who were accustomed to use the term India, as is still very usual, in place of Hindostan, applied it so as to comprehend countries which are now considered as distinguished from it by their natural features as well as their political peculiarities. With them, therefore, India was vastly more extensive than with the moderns; but it is worthy of remark, that their mode of subdividing it into India *within* the Ganges, and India *beyond* or *without* the Ganges, implied their acquaintance with one, at least, of the physical distinctions now alluded to. Their India stretched from Persia on the west, to the borders of China, as far as were known, on the east; and from Tartary on the north, to an interrupted line extending from the southern point of Ceylon towards some of the isles contiguous to the Malayan peninsula on the south. Besides Cabul, Cashmere, part of Tibet, Nepaul, Bootan, and other large districts on the north-west, north, and north-east, and the island of Ceylon in the south, comprehended in this wide space, it included several large kingdoms to the east, as Arracan, Siam, Ava, and Pegu, which are now commonly treated in a separate manner under their respective names, or are comprised under the modern appellation of the Birman empire. Mohammedan writers have used the term Hindostan to denote the country once under the dominion of the sovereigns of Delhi, and which in the time of the emperor Acber consisted of the provinces of Lahore, Moultan, Agimere, Delhi, Agra, Allahabad, Bahar, Oude, Bengal, Malwah, and Guzerat; to which was added, at various periods, some districts to the west of the Indus, as Cabul and Cashmere on the north-west, and Berar, Khandeish, and Ahmednuggur or Aurungabad, provinces of the Deccan. The Brahmins, who give the name of Medhyama, signifying central, (in allusion to the centre of the back of the turtle imagined by them to support the world,) to the country over which their religion has extended, describe it as the space between the Himalaya mountains on the north, and the strait between Ceylon and the continent on the south.

Boundaries.

The European geographers of modern times, following in some measure the sentiments of the natives, have given to the name such an extension as embraces the regions in which the Hindoo doctrines are established. The principle on which this limitation rests is obviously unsatisfactory in a geographical point of view, as the prevalence of the Hindoo faith may be greater or less at various times. But it so happens that certain physical peculiarities of a very striking kind correspond with the boundaries thus defined.

According to this last arrangement, to which we mean to adhere in this sketch, Hindostan is limited on the west by the river Indus, or rather perhaps by the Araba to the west of that river, and the province of Sinde; on the north by the Himalaya mountains, which extend from the Indus about the 35th degree of north latitude, skirting the valley of Cashmere in a south-easterly direction beyond the kingdom of Bootan; on the south throughout by the ocean; and on the east, where the boundary is less easily defined, by the range of hills and forests on the border of the Bengal districts of Chittagong, and north to where the great river Burrampooter, or, more correctly, Brahmaputra, after having long flowed nearly due west, takes a sudden turn towards the south, and forms the south-eastern boundary. By this distribution, then, Hindostan lies between the 8th and 35th degrees of north latitude, and the 68th and 92d of east longitude, reckoned from Greenwich,—a space of about 1900 miles in length from north to south, and 1500 miles in breadth from east to west, but which, on account of sundry irregularities of figure, cannot be estimated above 1,280,000 English square miles. This adjustment excludes Baloochistan and Afghanistan on the west, the almost totally unknown country of Little Tibet and Tibet on the north, Bootan and Assam on the north-east, several estates adjacent to Assam, Ava, and the Birman empire, on the east and south-east.

A region so extensive as nearly to equal the whole of Europe south of the Baltic, and which consists, in reality, as will soon appear, of several countries, which are plainly distinguished from each other, can scarcely be described in any general manner. Yet it is possessed of several common features which are characteristic, and which therefore require to be specified. These, of course, chiefly relate to its geological aspect, the distribution of its rivers and lakes, and the position and extent of forests and deserts on its surface. Its botany, zoology, and meteorology, being more dependent on its geographical situation, present greater resemblances to those of other countries which have a similar place on the globe, and consequently do not demand so much attention in this outline.

Aspect.—The general appearance of Hindostan, is that of a combination of vast plains, interspersed with ranges of hills of no great elevation or size. It is plentifully watered by rivers, but has few lakes; and presents many extensive morasses, and prodigiously large forests. The points on which the eye would chiefly rest, in glancing over its surface, are the immense flat lands in the neighbourhood of the Ganges and the Indus, towards the east and the west, the high table land above the Ghaut chain of mountains in the south, and the Himalaya ridge, which forms the northern boundary. Hindostan has no volcanoes in an active state; and the evidences of the former existence of such as are extinguished, do not amount to decisive proofs.

Rivers.—The rivers, by their number, length of course, and the volume of their water, constitute one of its noblest features. The principal of these, reckoned in the order of their supposed or probable length, may be thus enumerated. The Indus runs 1700 miles, including its windings; the Brahmaputra, 1650; the Ganges, 1500; the Jumna, comprehending its alliance with the Ganges, also 1500, but only 780 to its junction with that river; the Sutuleje, to the sea 1400, but to its junction with the Hindus 900; the Shylum, to the sea 1250, but only 750 to the Indus; the Gunduck, 980 to the sea, 450 to the Ganges; the Godavery, 850; the Krishna, 700; the Nerbudda, 700; the Mahanuddy, 550; the Tuptee, 460; the Cavery, 400. And, besides these, there are many which would be considered large in Europe. These rivers, though, in consequence of the vast plains through which they take their course, generally proceeding towards their termination in a slow stream during the dry season, are subject to such immense additions of water in the wet months as to become astonishingly rapid, and sometimes extensively destructive to those villages which are placed too near their banks. This change occasionally happens within a few hours, in which time certain rivers have been observed to rise 20 feet above their usual level, when they rush down with awfully alarming noise and fury. It is remarkable that some rivers, which were formerly reckoned to be of great bulk, have either altogether disappeared in modern times, or are degenerated into insignificant streams. Of the lakes may be mentioned, that of Colair, or Calloor, between the rivers Godavery and Krishna, on the south-east side of Hindostan, which, during the periodical increase of these rivers, is from 40 to 50 miles in extent; that of Chilka, on the east coast, where it separates the five Northern Circars from Cuttack, and which is about 35 miles long by 8 broad, consisting of salt water, and divided from the sea by a narrow slip of land that is invisible at some distance from the land; one of large size at the north-east corner of the province of Guzerat; a few of smaller extent in the adjoining province of Agimere, and others a little farther north in the province of Delhi. What is called *the Runn*, or *Erun*, is an extensive salt morass on the west frontier of Guzerat, which assumes various appearances in different places and at different seasons, being sometimes a sheet of shallow water, at others an impassable swamp, and occasionally a dry bed of sand, covered here and there with a salt incrustation, or yielding a scanty pasturage. Its superficies has been estimated at no less than 8000 square miles, without comprehending any part of the gulf of Cutch, with which it communicates on the west. Almost in the same parallel of latitude, but at the eastern extremity of Hindostan, there exists another singularity, denominated the *Sunderbunds*, a word properly signifying a *forest of Soondry trees.* This extends about 180 miles along the bay of Bengal, and is every where perforated with rivers and creeks,—all of which are salt, except those immediately connected with the principal stream of the Ganges. It has eight openings towards the coast, each of which appears to be the chief mouth of that river; and a complete inland navigation may be carried on throughout its entire extent, by means of natural canals. There are numerous forests in other parts of this region.

Mineralogy.—As to mineralogy, Hindostan is rather to be called rich than extensive or interesting. It is well known to furnish diamonds, sapphires, rubies, and other precious stones, in considerable quantity, and of high value. Gold is only to be met with in the waters of those rivers which flow from Tibet into the Ganges and Indus,—never in mines. Silver and copper are scarcely to be discovered; but iron is very abundant. Several mineral salts are largely diffused throughout some of the provinces; and, consequently, mineral waters are frequent. Only a few of the former have been much worked; and, hitherto, it may be said, little attention has been paid to this part of the natural history of Hindostan. A similar remark applies to a number of detached or isolated rocks, some of them of great height, to be seen in this country, the construction and composition of which have been rarely described by scientific men. Varieties of granite, gneiss, and other compound rocks, are to be observed in the country above the Ghauts, and generally in vertical strata. They are conspicuous also in Coimbetore. But the secondary and alluvial formations are conceived to be much more usual.

Soil.—The soil, generally speaking, is defective in firmness and tenacity; but it is of good quality, and often consists of a blackish coloured vegetable mould several feet in thickness. It is singularly well adapted to the culture of rice, which is the staple grain of this large region. Maize, sugar, and

Hindostan.

cotton, are plentifully and easily grown in some districts; and fruits, plants, and vegetables peculiar to the climate, are produced in the greatest luxuriance and of the choicest quality. It is enough to appeal, for examples, to the varieties of palms, the pillaw-tree, the mango, the tamarind, the laurus cassia, the banyan tree, and the Indian fig. Many of the medicinal substances taken from the vegetable world, and held in the greatest repute in Europe, are the product of this fertile and highly favoured land.

A region which runs through so many latitudes must have great diversities of climate. But in Hindostan the temperature is generally high; and the seasons, though considerably modified by local circumstances, partake greatly of a common character. Thus, what we call winter is scarcely known there; whereas the division into dry season and wet or rainy season is universally observed, though the times of their occurrence are not the same throughout. Those alternations of the wind from south-west to north-east, denominated monsoons, are among the regular characteristics of Hindostan.

As to zoology, this region can boast of the elephant, the rhinoceros, the tiger, and the nilghau, besides having plenty of leopards, panthers, lynxes, hyenas, bears, wolves, and many other smaller quadrupeds.

The population of Hindostan has been recently estimated at 134 millions, of whom 83 millions are reckoned to be under the British government, and 15 millions are styled British allies and tributaries; the remaining 11 millions being assigned to the independent states of the Nepaul raja, the Lahore raja, the ameers of Sinde, the dominions of Sindia, and the sovereign of Cabul. The form and features of the indigenous inhabitants bear a strong resemblance to the Persian and European model; and in the northern districts their complexions are tolerably fair, with an occasional mixture of ruddiness. But those who dwell in the south are of a deep olive, or almost a black colour, without the woolly hair and flattened-like features peculiar to African negroes. As the country has been either overrun or much visited by other nations, at different periods of its history, several admixtures or mongrel appearances are plainly discernible among the people.

The two religions which prevail most widely among this immense population are the Hindoo and the Mahommedan; the former being more extensive than the latter, in the proportion, it is conceived, of seven to one. The sects of the Buddhist, and Jain, erroneously comprehended under the former by many Europeans, profess a creed directly at variance with that of the Brahmins. The Christians are not supposed to amount to more than half a million, a very small number, indeed, considering the long intercourse of Europeans with this country. But the reasons for it are obvious to all who are acquainted with the prejudices and institutions of these people, which present difficulties in the way of conversion, superior, perhaps, to what occur in the case of any other country. The mythological reveries and religious practices of the Hindoos are so absurd and nonsensical as only to deserve attention because of their deplorably overwhelming influence.

Hindostan.

The governments in Hindostan are numerous, and generally in a variable and unsettled state,—the consequence of frequent hostilities carried on between the natives themselves, as well as those which have originated in the measures and policy of their various conquerors. The preponderance of the British, to which allusion has already been made, is one of the most singular events in history, and seems to promise an entire revolution in the course of time. But there is reason to regret, that all the political and social advantages which might be expected to accrue to Hindostan from a connection with our own country, have not yet been realized. One consequence of the frequent transitions of power is very discernible in the nearly total indifference of the natives to any particular form of government, and indeed to any particular master. No political system seems long to obtain their preferable regard; and a habit of submission renders them an easy prey to any force that is capable of inspiring personal fear, of which they are remarkably susceptible. If guaranteed in the enjoyment of their religion, and left unmolested in their domestic concerns, it is almost entirely immaterial to them who assumes the sovereignty, or what denomination of rule is established over them. This apathy undoubtedly contributes to that sort of Epicurean ease in which they are disposed to pass their lives; but it utterly unfits them for attaining some of the greatest excellencies that mankind can enjoy, considered as social and intellectual beings. The idea of civil liberty no more suggests itself to the natives of Hindostan than if it were quite inconceivable, and it is accordingly without a name in any of their numerous languages.

The titles of honour established among the natives have usually a reference to some office, emolument, or power, and are rarely hereditary,—these simple people attaching no value to a merely nominal distinction. If in this particular they differ so much from Europeans, they are no less remarkable for the appointment of castes, or perpetual orders of men, the characteristic marks, and rights, and duties of which have been preserved with the most punctilious circumspection, from the earlier ages of their history. These castes, which are imagined to have been instituted by Brahma, their supreme deity, are denominated in such a manner as to indicate their substantial and irrevocable peculiarities,—as the Brahmins, from the mouth, (denoting wisdom,) who are the priests of the Hindoos, and whose duty it is to pray and to instruct; the Khetri, Chehteree, or Cshatriya, from the arms (strength,) and who, accordingly, fight and undertake the offices of government; the Vaisya or Bice, from the belly, or thighs (nourishment,) who are engaged in providing the necessaries of life by agriculture and trade; and the Sooder or Sudra, from the feet (subjection,) who constitute the labourers and servants. The subdivisions of the castes, which are numerous, it is thought unnecessary to particularize. The term Pariar is applied to those who are degraded from the other classes, in short, the outcasts of the Hindoo tribes.

As the titles of honour, and the names of office, and employment, or business, used in Hindostan, and of frequent occurrence in works which treat of India affairs, may not be well understood by the general reader, it is judged proper to insert the following alphabetical explanation of them, to which is added a small number of other personal terms, with their significations.

Ameer, a nobleman, sometimes written and pronounced Emir.
Aumildar, any functionary or agent, the holder of an office.
Baboo, a title of respect among the Hindoos.
Bairaggies, certain religious characters.
Banyan, a shopkeeper or merchant.
Begum, a female of rank, a lady or princess.
Buddick, a particular species of public robber.
Bukshee, a commander-in-chief, also a paymaster.
Burkindazes, soldiers who use match-locks.
Canongoe, a superintendant of the land revenue, a government officer employed to give information in matters relative to rents, tenures of property, the amount of land cultivated, &c.
Cauzi, a judge or justice, also a public notary.
Chokeydar, a watchman or guard.
Circar, or Sircar, a term used by Europeans to denote a Hindoo writer or accountant, but more frequently applied to a certain number of villages, with a corresponding tract of country, intermediate between a county and a province, or grand division.
Coolies, labourers, porters.
Cozauk, a robber on horseback.
Curnum, the register or accountant of a village.
Cutwal, the chief police officer of a city.
Dacoit, a species of robber.
Dewan, a prime minister, or chief officer of the finance and revenue. A modification of this word, namely,
Dewanny, is applied to the East India Company, considered as receivers-general of the revenues of Bengal, Bahar, and Orissa, consigned to them by grant from the Great Mogul in 1765. And the same term, with the addition of *adawlet*, denotes the court where causes affecting the revenue are tried.
Dobash, an interpreter.
Fakeer, a religious mendicant among the Mahommedans.
Foudjdar, a military commander.
Gooroo, a species of teacher in the Hindoo religion.
Hakim, a governor, ruler, or master in a province.
Jogies, devotees among the Hindoos.
Killadar, keeper of a castle, or commander of a fort.
Lascar, a sort of military servant, or camp follower.
Looty, a plunderer.
Malgoozar, one who pays rent, or contributes to the revenue.
Mufti, among the Mahommedans, the law officer who declares the sentence of a court.
Mundul, the chief man of a village.
Munsif, a judge in minor cases of litigation.
Nabob, a viceroy or deputy under the Mogul.
Nizam, a personage of high rank, so called from the nature of his office, which relates to ordering or arranging the affairs of states or provinces.
Peer, a Mahommedan saint.
Peon, a foot soldier, often employed in the service of the police or revenue.
Peshwa, a leader. The late sovereign of the Poona Maharattas was so called.
Poligars, small landholders, under tribute, in the south of India.
Potail, the chief man of a village, engaged in its superintendance.
Pundit, a learned Brahmin.
Pykes, watchmen and messengers, also a kind of militia.
Raja, king, prince, or nobleman, a title formerly given to the chiefs of the military caste.
Rajpoots, a title of honour derived from the preceding, and properly limited to the higher classes of the same caste, but often more extensively used.
Rana, used, in some of the northern provinces, much in the sense of Raja.
Ranny or Rajni, a similar title, applied to females, as the wife of a Raja.
Ryot, a peasant or subject.
Sanyassies, Hindoo devotees.
Sebundy, a sort of irregular militia-man, often used in police.
Seid, a descendant of Mahommed.
Sepoys, the native militia in the service of the British.
Shroff, a banker.
Shias, members of the sect of Ali.
Sirdar, a captain or leader.
Singh, a term for the military caste.
Soonees, Mahommedans who acknowledge equally the four successors of their prophet.
Soubahdar, the governor of a large province.
Talookdars, petty landholders who contribute to the government.
Tannadar, the commandant of a police station called Tanna.
Thugs, a class of public robbers.
Tehsildar, a native collector of a district.
Vakeel, an ambassador, agent, or attorney.
Zemindar, a landholder, or landkeeper of a class superior to a Talookdar, and having a certain jurisdiction.

The manners and customs of the Hindoos are closely connected with their religious opinions, and are nearly the same throughout this country. Some of the principal are, the practice, now, it is hoped, greatly on the decline, of widows devoting themselves to the same flames which consume the bodies of their husbands, but carried on to such an extent, even recently, that in the year 1817, as appears by official papers, no fewer than 705 females thus perished in the presidency of Bengal; that of polygamy, which, though conceived lawful and very extensively adopted, is not allowed to destroy the superior consequence of one of the wives; and abstinence from animal food and spirituous liquors, imposed on some of the castes,—a species of self-denial which, it would appear, in opposition to the whimsical notions of certain theorists, does not tend in any measure to the improvement of their morals. The great mass of Hindoo and Mahommedan population throughout Hindostan is nearly in the same degree of attain-

Hindostan.

ment as to civilization; but there are several races of mountaineers occasionally mixed with it, who retain their original rudeness of manners. Such are the Gonds, Bheels, and Coolis.

One of the worst features in the moral condition of Hindostan, is the degraded state of females. It is obvious, that they are considered as entirely subservient to the pleasures of the other sex; and it is equally obvious, that these pleasures are any thing but intellectual. Hence the ignorance in which these unfortunate beings are held, the vexatious restraints which are imposed on them, and the corresponding apathy and unmeaning sameness which characterize them; and hence, too, so completely is every instruction, deserving the name of education, generally denied them, that they are not allowed to fit themselves for what are thought, in other countries, the common duties of wives and mothers. It is highly probable that many of them, whether from the native impulse of the mind, or the influence of some superior light which has penetrated their seclusion, are painfully aware of their inferiority in the scale of human beings, and consequently, in addition to the pressure of their various misfortunes, experience the agony of comparing their unjust fortune with the happier lot of other women. The practice of child-murder, so frequent with Rajpoot mothers, but confined, it is believed, to female infants, may therefore, perhaps, be partly ascribed to a sort of maddening resentment, mingled with a feeling of affection, which has no other mode of displaying itself than by preferring the extinction of their hopeless offspring to the certainty of entailing their own unhappiness upon them.

Domestic slavery exists in various degrees throughout Hindostan. It is, on the whole, of a mild character; but it is painful to think, that many of those who are subjected to it are the children of poor people, who have been obliged to sell them in times of distress. In some places bond-servants are employed to cultivate the land; and, in others, the peasants have beneath them slaves, who are generally well treated, and frequently experience a kind of emancipation.

Men of consequence, among the Hindoos, usually spend a great deal of their time in cooking, which seems to be one of the chief businesses of life with them. Drunkenness is frequent enough with those who are not proscribed intoxicating liquors; and even many of those who are so, contrive to stupify themselves sufficiently with extracts of poppy, hemp, and other substances,—a practice considered very disreputable in a Brahmin, though it do not subject him to the penalty of forfeiting his caste. Tobacco is in common use with both sexes; but there is a sort of recognized rule as to the mode of indulging in it on the part of the sexes. Thus, the men rarely chew it, but generally smoke or snuff; whereas women chew it, almost universally in some provinces, but, unless of the very lowest tribes, and abandoned in character, will not smoke it.

The common dress of the wealthier Hindoos consists of various pieces of cloth wrapped round the body, and fixed, so as to prevent their coming off, merely by thrusting the ends of them under the folds. But men of rank occasionally adopt the garb of the Mahommedans; and the poor, again, content themselves with a single piece of cloth applied over their loins. They keep the head bare, and do not wear stockings. The women are remarkably fond of trinkets, which they attach to all parts of the body, when they can procure them in sufficient number. They are also in the habit of painting, and for this purpose often employ red-lead; but they lay the pigment on their foreheads, and not their cheeks, as with us.

The languages of Hindostan form a singularly interesting topic of discussion, to which it is sufficient merely to advert in this place. The original language is the Sanscrit, imagined by Sir William Jones to have come from Persia, and the antiquity of which is so great, that there is no record or tradition respecting the people with whom it was oral. From this, in very early times, sprang the Prakrit, in which much of the Jainas superstition is written; the Bali, equally revered among the followers of Buddha; and the Zend, held sacred by the ancient Persians, and which is the depository of the works of Zoroaster. In more modern times, and during the existence of ten civilized nations, which are understood to have occupied the whole of Hindostan, there prevailed an equal number of well polished dialects, numerous remains of which are still current. These are the Saraswata, Kanoje, Gour, Maithila, and Orissa, denominated the five Gaurs; and the Tamul, Maharatta, or Marashda, Carnata, Telinga, or Telenga, and Guzara, denominated the five Dravirs. The Hindostanee is at present the universal language of intercourse in this country; but besides it, and in addition to the ten now mentioned, there is a considerable number of dialects, the use of which is confined to certain districts, as the Bengalese, the Cashmere, the Dogura, Ooch, Sundy, Cutch, Concanese, Punjaby, Bicanere, Marwar, Jeypoor, Odeypoor, Harowty, Malwah, Bruj, Bundelcund, Magadha, Koshhala, and Nepaulese, nine-tenths of the whole of which are conceived to be common, and the basis of all of which is the Sanscrit.

The literature of Hindostan presents several curiosities, and this is all, perhaps, that can with justice be said of it. For, not to call in question its boasted antiquity, about which there has been so much controversy, it is far more remarkable for a wildness of imagination, approaching to childish extravagance, than for any of those qualities which have given imperishable reputation to the works of Greece and Rome. The most important books are the Vedas, written in Sanscrit, and which the Brahmins ascribe to an antiquity utterly beyond all rational chronology, but which certainly must be admitted, on every or any view of the subject, to be of respectable age. These Vedas, which are four in number, divided into many sections, constitute what may be called the Bible and Prayer Book of the Hindoos, as they contain not only a system of theological opinions, and a body of precepts and maxims for the regulation of life, but also a collection of prayers appointed to be used on public occasions. The Puranas, again, which are next in repute, cannot boast of the same antiquity. They are the product of various periods, and consequently different individuals; and, besides this heterogeneous origin, they exhibit several evidences of interpolation, and having been sophisticated. They are eighteen in number, and pretend to the dignity of histories, but in reality are only idle, often almost unintelligible romances, and deserve much more regard from their poetic form and dress than either the correctness or the utility of their matter. The Hindoos, it may be confidently stated, do not possess a single historical document of any great age, or of any appreciable value. Among their epic poems, the most ancient and most esteemed are the Ramayana and the Mahabarat. No small degree of merit has been claimed by some writers for the Hindoos, on the ground of their attainments in astronomy. But these are probably of much later date than has been assigned to them; and, in point of science, these people can no way bear comparison with their neighbours the Chinese. The art of printing is unknown to them. On the subject of music the ancient Hindoos were not a little singular. They seem to have confined themselves to 36 melodies, every one of which was appropriated to a particular portion of the day or the night, so that, according to rule, it could not or ought not to be used but at a specified period. Painting and sculpture have made little progress. The laws of the Hindoos are abundantly numerous and minute, but exhibit so much inconsistency and confusion that they scarcely ever serve as authority for those who hold the office of judges, whose decisions consequently partake more of caprice and private opinion than of well known and generally admitted enactments; yet, in the minds of the people, these laws are imagined to possess an excellence which fully equals the highest character of any other code, that is, as it is alleged, they contain a provision for every supposable case, whether of a criminal or a civil nature.

Certain manufactures have arrived at great perfection in this country, and have long served as models for the artizans of Europe. It is enough to mention those of muslins, callicoes, and silk, or rather camels-hair shawls,—the qualities of which last have never been surpassed elsewhere. The brilliant and durable colouring given to some of their fabrics, must be imputed rather to the goodness of the materials employed than to any perfection in the art of dyeing. Most of the implements used in the arts are of very simple construction; and hence the fineness of the work must be imputed chiefly to the dexterity and careful habits of the operatives. The looms, for example, on which the far-famed shawls are wrought, are of such a nature as to admit of being arranged for use in the morning under a tree, and taken down in the evening for the purpose of being carried home. One peculiarity observable in these shawls, by which they may be readily distinguished from those of our own country, is the circumstance of the figures which are worked on them being entire on both sides of the fabric, and not cut on one side. The mode of accomplishing this is perhaps still unknown to British manufacturers, as the natives are not a little jealous of any one who might pry narrowly into the process. In addition to its wrought goods, Hindostan exports immense quantities of raw materials, besides its spices, drugs, and precious stones.

The chief source of government revenue throughout this region is the land, which is subjected to direct taxation; and it is to this that the British, as well as the independent princes, generally look for the ways and means of their respective administrations. It has been hitherto found impossible to remedy any inequalities in the tax on land by the imposition of other taxes; but it is certain that, however irksome it may be to them, the Hindoos require the agency of the system in order to overcome their constitutional indolence.

The early history of Hindostan is involved in an obscurity which the efforts of the ablest and most erudite men have hitherto failed to dispel, and which the industry or ingenuity of the native Brahmins, who pretend to treat with exactness of the events of thousands and even millions of years, has only rendered more dense and suspicious. Passing over, then, the mythological and utterly incredible relations of the most ancient periods, as well as the fabulous expeditions of Bacchus, Semiramis, and Sesostris, and the more genuine but little elucidated visit of Darius the son of Hystaspes, we arrive at the invasion of Alexander, at which time, it is highly probable, there existed a considerable number of separate monarchs throughout this region. The western part of Hindostan, which was all that he visited, had then several potentates; and there is no good reason for supposing, according to the native historians, that either the northern or the southern portion was under the government of one powerful sovereign. Seleucus, one of the successors of Alexander, penetrated farther into the country than that enterprising hero; but was soon obliged to return, in order that he might defend his own dominions against the threatened invasion of Antigonus. He afterwards sent an embassy to Sandracottus, the capital of whose kingdom, named Palibothra, was on the south bank of the Ganges, supposed by some writers to be where the large city of Patna now stands, but by others to have had the site of Allahabad. Megasthenes, the ambassador on this occasion, returned after several years residence at Palibothra, and drew up an account of his travels, which would have merited distinction as an historical document, if he had not so frequently substituted marvellous stories for actual observations. The Syrian monarchs soon ceased to have any dominions in Hindostan after the death of Seleucus; and then, in the course of rather more than a century, a horde of Tartars broke in upon the provinces in which their power had been established, and obtained a settlement. Several ages elapsed after this irruption, without any other attempt being made by a foreign power to gain a footing in Hindostan, as the Greeks and the Romans, who were best able to effect this, as well as the Egyptians, seem to have preferred a commercial intercourse with the countries of the east, to the hazard of a distant and problematical expedition for the purpose of conquering them. Berenice, built by Ptolemy Philadelphus on the western coast of the Red sea, was for some time the emporium of the trade with this country; but gave place to Myoshormus, nearer the bottom of that gulf, where there was a much more commodious harbour. The commerce, carried on through this channel, continued after the Roman arms prevailed over Egypt; and indeed does not appear to have undergone much alteration till the irruption of the barbarous nations extinguished the declining glory of the empire, when the Arabs diverted its course. Subsequent to this event, and greatly in consequence of it, the merchants of the eastern capital, still intent on obtaining the productions of India, restored the ancient but expensive and dangerous communication over land, and thus contrived, though at more expense, to gratify the prevalent taste for those foreign commodities, an enterprise in which they were followed by the Venetians and Genoese.

The first Mahommedan conquests in Hindostan commenced about *A. D.* 1000, under Mahmoud or Mahmood, sultan of Ghigni, the ancient Bactriana; but they extended no farther than to the province of Moultan, in the course of about eight years. He afterwards proceeded towards the Ganges, destroying in his course the pagodas, or temples, and other monuments of Hindoo worship, and urging conversion to Islamism by all the energetic measures of a military apostle. His posterity were expelled by the Gaurides, who pushed farther to the east, and, under their chief Mahomed Gori, perpetrated as great barbarities against the worshippers of Brahma. Cuttub, one of the generals of that prince, founded the Patan or Afghan dynasty, and established the imperial residence at Delhi, where it has continued since with few interruptions. Altamah, his successor, made a conquest of much of Hindostan Proper in 1210; and in his reign, a few years afterwards, Gangis-Khan, or Zengis, subdued the empire of Ghizni, and overran a great part of Hindostan, an example that was imitated, with decisive effect, about the end of the 14th century, by Timur or Tamerlane, the khan of Tartary. Baber, a descendant of Tamerlane, and sultan of the Mogul Tartars, having lost the northern part of his own dominions by the hostilities of the Usbec Tartars, made an attempt at conquest on Hindostan about the year 1525, and with such success, that, putting an end to the dynasty of Lodi in Delhi, he established what has generally been called the Mogul empire, which was raised to the greatest splendour and authority under Aurungzebe, towards the end of the seventeenth century. After his death it declined through the weakness and quarrels of his successors, and ultimately sank into obscurity and insignificance before the victorious arms and equally victorious policy of the famous Nadir Shah, the Persian monarch. In the latter period of this empire arose the power of the Mahrattas, who were troublesome for a considerable time, but who sustained an irreparable defeat in 1761, in the remarkable battle of Panniput, fought against the Mahometans, under Abdalla, king of Candahar, where the amount of both the armies engaged is supposed to have been 350,000 men.

The settlement of the Europeans in Hindostan commenced with the Portuguese, after the discovery of the route to India by doubling the southern cape of Africa. They were followed by the Dutch and these again by the French, who had the ascendancy from about the year 1749 to 1761, when the English, who had for some time been extending their commerce in this direction, obtained possession of their chief settlement Pondicherry. That place was restored to the French in 1763. Its fortifications were afterwards destroyed, namely, in 1779. They were again repaired; but suffered a final overthrow in 1794. An expedition into Tanjore, in 1749, was the first military enterprise of the British against the natives. It was followed by several operations in the Carnatic. But the rapid extension of our countrymen must be dated from the battle of Plassey, fought in June 1757, in which colonel, afterwards Lord Clive, obtained a decisive victory over Sujah Dowlah. The disproportion of numbers engaged on that occasion affords a remarkable proof of the relative excellence of the respective armies. The force under Dowlah was estimated at above 60,000 men; whereas those of Clive did not reach 4000, of whom only 900 were Europeans. The same able officer, in 1765, obtained for his countrymen, by a grant from the Mogul, whose power had now almost utterly vanished, the provinces of Bengal, Bahar, and part of Orissa, on condition of an annual tribute; and accordingly, in that year, the dewanny, or right to collect the revenue arising from the tax on land, was established in their favour. Soon after this concession, a new and formidable enemy to the British arose in the person of Hyder Ally, who had established himself in Mysore, and was extending his conquests, and with whom there were various conflicts, which did not prove decisive to either party. He died in 1783, and was succeeded by his son Tippoo Saib, whose hereditary hostility to the English, after being carried on for several years, with little judgment on his part, but great animosity, terminated with his life, in the storm and capture of his capital, and the subjection of his territories, in 1799.

The principal accessions to the British dominions which have been made since that period, may be thus summarily stated. In 1800, the districts of Bellary and Cuddapah, ceded by the Nizam: In 1801, certain territories ceded by the nabob of Oude, as Rohillcund Bareily, Moradabad, the lower Doab, and the districts of Furruckabad, Allahabad, Caunpoor, Goruckpoor and Azimghur; also the Carnatic province, comprehending the territories of the nabob of Arcot: In 1803, Delhi, Agra, the upper Doab, Hurrianna, Saharunpoor, Merut, Alighur, Etawah, Bundelcund, Cuttack, Balesore, Juggernauth; besides cessions in Guzerat, made by the Peshwa and Guicowar: The conquests from the Nepaulese made in 1815, consisting of the hilly country between the rivers Sutuleje and Jumna, and the districts of Gurwal and Kumaon: In 1816, several places in Cutch: In 1818, the whole of the Peshwa's dominions, Khandeish: Saugur and other places in Malwah; Ajmeer in Rajpootana; Sumbhulpoor, Sirgoojah, Gurrah, Mundlah, and other places in Gundwana, ceded by the Nagpoor raja. The territories of the British are divided into the three presidencies of Bengal, Madras, and Bombay,—those of the first named being greatly most extensive, and those of Bombay the smallest; but besides them there are important accessions made since 1815, in the Deccan, which have not yet been attached to any presidency. Possessions so large as probably to amount to considerably more than 500,000 square miles, which have not been acquired without many circumstances calculated to occasion a feeling of hatred among the original inhabitants, and which, from the opposition and contrariety of interests of those independent states that are in the immediate vicinity, are always liable to be disturbed, cannot be retained without the presence and very apparent efficiency of a large military force. That of the British East India Company's government, accordingly, is no less formidable from its magnitude, than respectable for its state of discipline, and constant readiness to take the field on the least occurrence of a hostile or injurious nature. A portion of it always consists of some of his majesty's troops; another portion is made up of Europeans regularly enlisted and organized on the company's account; but by far the largest portion of it is derived from the native subjects of the government. A return of the military forces of every description serving in India, presented to parliament in March 1819, gives us the following particulars.

Regulars.—King's troops.	Cavalry,	4,692
	Infantry,	17,858
	Total king's,	22,550
	East India Company's European artillery,	4,583
	Do. do. infantry,	3,120
	Total Company's Europeans,	7,703
	Native cavalry,	11,011
	Native infantry,	132,815
	Native artillery, including gun Lascars attached to the European artillery,	8,759
		152,585
	Total regulars,	182,838
Irregulars.—Native cavalry,		7,659
Native infantry,		17,082
	Total irregulars,	24,741
	Invalids and pensioners,	5,875
	Grand total,	213,454

The amount of British armies actually in the field during the campaign of the preceding year was 95,000, and to each of these, according to the practice of the country, may be ascribed on an average 4½ followers; so that the sum total was above half a million of souls.

The revenue accruing to the British government in Hindostan in 1817-18, was estimated at within a trifle of L.20,000,000 sterling; while the aggregate debt of the three presidencies for 1818 amounted to about L.34,000,000. The debt of the company, like that of the mother-country, is not likely to be soon liquidated, because, generally speaking, the expenditure keeps pace with the augmentation of revenue. But the pressure of the debt is little felt; and there are not wanting arguments to prove, that some benefits arise from it which could not well be accomplished by any other means, in the circumstances of the present relation between the people and the government.

Much there is in the history of the establishment of British power in Hindostan to which the moralist will object; and many imperfections there are in the administration of that power which call forth a feeling of regret. Conquests are never altogether innocent; and perhaps the connection is inseparable between an effective government of any kind and certain violations of natural right. But, even after taking into account several aggravating peculiarities in the present case, there will remain good reasons to imagine that the interests of humanity have, on the whole, been promoted by the predominance of the British arms in this extensive region. It can scarcely be a question to occupy a judicious mind beyond the moment in which it is stated, that the condition of the natives in every essential ingredient of rational happiness and political importance was worse under their indigenous administrations than it now is. Moreover, the former presented no hope of melioration. No beneficial effects could be expected from successive changes of power, while the principles on which the various contending governments seemed to be built were all essentially opposed to the intellectual and moral dignity of the species, and, though they differed in degrees of worthlessness and absurdity, had all the same tendency to debasement;—whereas it is inconceivable that an emanation from a community, such as that of Britain, which, in respect of its constitution, its privileges, and its attainments, immeasurably excels any of the political fabrics of the ancient world, should not diffuse advantages utterly unknown to a people so degraded and deluded as the Hindoos. Still the time is far from having arrived, when the full agency of our institutions can be imparted to them, and when all recollection of the events which led to it will be gratefully merged in the enjoyment of what is conferred. The necessity of securing our acquisitions against a host of rivals and enemies, at first rather a motive for defensive and precautionary measures, but ultimately the instigator to offensive operations, has hitherto retarded the great and imperative duty of civilization; nor can it be denied, that some illiberal prejudices, not to say malignant feelings, have occasionally frustrated various benevolent designs which would probably have contributed to it. A good deal of solicitude, therefore, as to the state of India, now exists in the minds of those who estimate the consequence of human beings on principles more exalted than the maxims of the politician. How this may ere long operate by influencing those individuals whose official or copartnery relations with the country create a responsibility of the most awful nature, it is imposible to determine; but independent of such interference, which is more to be wished than expected, there is some guarantee to the hopes of the philanthropist in the now generally acknowledged superiority of the British, which may be expected to render hostilities less frequent than formerly, and, consequently, to favour the extension of any friendly intercourse that has been suggested by regard to common interest, or the higher consideration of morality and religion. When apprehensions of any attacks on our dominions, so long the paramount agent in the British government, has ended in the full and just conviction of invincible power, and when the jealousy of the natives, as to any forcible violation of their sacred customs and ceremonies, has been sufficiently lulled by perseverance in our apparent indifference to their foolishness and atrocity, it is reasonable to think that both parties will so far approximate as to allow the free exercise of judgment on the points of difference between them. It would be painful to imagine that there could be a shadow of doubt as to the issue. The gloomy genius of superstition, and its soul-appalling attendants, must vanish before the effulgence of a system which has truth for its basis, and the happiness of man as its aim.

We now proceed to the subdivision of this region, and to treat of the more remarkable particulars in the various states of which its consists. Major Rennel, who has contributed largely to the geography of Hindostan, describes it, after having considered its coasts and islands, in four sections: 1. That part which is occupied by the Ganges and its chief branches: 2. That which is situate in the course of the Indus: 3. The country lying between the Krishna and the two divisions now mentioned: and, 4. The triangular country extending from the south of the Krishna to the east and west sea coasts. This arrangement has been generally followed, and is susceptible of defence on the ground of convenience and tolerably conspicuous geographical indications. The arrangement into eastern, northern, western, and southern, though ostensibly simple, and therefore likely to claim attention, is liable to the objections stated by Mr Pinkerton, that the northern cannot well be separated from the western, as both are connected by the course of the Indus, and that the deficiency of natural boundaries would require to be compensated by imaginary lines. According to Mr Hamilton, Hindostan presents four grand geographical divisions, enumerated and subdivided as follows.

1. NORTHERN HINDOSTAN, commencing from the Sutulege river on the west, stretching in an easterly direction, and with an inclination southwards to the river Teesta, in longitude 88° 30′ east, and separated from Tibet on the north by the Himalaya range, and from the old Mogul territories on the south by the lower ranges of hills which press on the plains of the Ganges. It comprehends, 1. The country between the Sutuleje and the Jumna: 2. Gurwal or Serinagur: 3. The source of the Ganges: 4. Kumaon: 5. Painkhandi: 6. Bhutant: 7. The territories of Nepaul: and 8. The Sikkim dominions. These countries may be said to form the highlands of Hindostan; and, like most mountainous regions, are inhabited by a race of people who have slowly admitted the improvements in civilization of their less elevated neighbours.

2. HINDOSTAN PROPER, the most extensive division, which stretches from the southern boundary of the preceding to the river Nerbuddah, and from the lower part of the Indus in the west, to the lower parts of the Ganges and Brahmaputra in the east. It comprises 13 large provinces, namely, 1. Bengal: 2. Bahar: 3. Allahabad: 4. Oude: 5. Agra: 6. Delhi: 7. Lahore: 8. Cashmere: 9. Ajmeer: 10. Moultan: 11. Cutch: 12. Guzerat: and, 13. Malwah.

These provinces are the remains of nearly as many Mahommedan kingdoms, and have long been noted for their fertility, and the high character, comparatively speaking, of their inhabitants.

3. The DECCAN, which has for its northern boundary the course of the Nerbuddah, and an imaginary line drawn from the source of that river to the mouth of the Hooghly or western branch of the Ganges; for its southern, the Krishna and Toombudra; the bay of Bengal on the east; and the Indian ocean on the west. Under it are enumerated nine provinces: 1. Gundwana: 2. Orissa: 3. The Northern Circars: 4. Khandeish: 5. Berar: 6. Beeder: 7. Hyderabad: 8. Aurungabad: and, 9. Begapoor.

4. INDIA, SOUTH of the KRISHNA, sometimes, but improperly denominated the PENINSULA of INDIA. It corresponds with the fourth division of Rennel, already mentioned, and comprehends, 1. Canara: 2. Malabar: 3. Cochin: 4. Travancore: 5. The Balaghaut ceded districts: 6. Mysore: 7. Coimbatoor: 8. Salem and the Barramahal: and, 9. The Carnatic.

We shall take these in order.

NORTHERN HINDOSTAN, as now specified, is about 600 miles long, and, on an average, 85 broad. Its most remarkable feature, as a country, is the amazingly lofty range which forms its northern boundary, generally known under the name of the Himalaya mountains,—the word Himalaya signifying "abode of snow," and being therefore suitable to such an Alpine region. This chain has its origin to the west of the Indus, where it is styled Hindoo Cosh by the Afghans. It is crossed by that river in about latitude 35° and longitude 74°; and then skirting the province of Cashmere, which it nearly encircles, runs in a south-east direction between Little Tibet and the province of Lahore; after which, in a course more directly eastwards, but with sundry breaks, it is projected along the northern border of the country, between the Sutuleje and the Jumna, Gurwal, and Nepaul, till it reach Bootan, beyond which it is conceived to penetrate, though with continually diminishing elevation, towards the Chinese sea. The discovery of this immense girdle has destroyed the claims of the Andes to be the highest mountains in the world; but the different authorities are not agreed as to the precise amount of their superiority, and farther observations are needed to settle the question. In the mean time, it is pretty generally believed, that one of the most elevated peaks of the Himalaya range, that of Dhawala-giri, or the White mountain, is not less than 26,862 feet above the level of the sea; and that there are several other peaks above 20,000 feet of elevation; besides many which are between that height and 10,000 feet. Few Europeans have hitherto ventured to cross these mountains, but some have visited them. Captain Turner, who was sent on an embassy to the Teshoo Lama, so early as 1783, penetrated that portion which borders on Bootan; and various observations have recently been made in other directions, as by Messrs Webb, Hodgson, Moorcroft, and Fraser. In some parts of this vastly elevated region the snow lies all the year; but in others it is melted during the heat of summer. Thus, captain Webb saw none remaining on the Niti Ghaut; but observed many quadrupeds grazing on the banks of the Sutuleje. Villages have been found scattered throughout the lower parts of these mountains, sometimes at an elevation of 6000 feet above the bed of the Sutuleje. According to the picturesque mythology of the Hindoos, Himalaya is a deity conceived to be the father of the Ganges.

1. The first country to be noticed under this head, is that which lies, as already mentioned, between the Sutuleje and the Jumna. It is about 90 miles long and 60 broad. But even this small territory seems to have been subdivided into separate states previous to its conquest in 1803 by the Gorkhas, whose power was lately subdued by the British under Sir David Ochterlony, not without considerable difficulty and expense of blood and treasure. Since that event, the former princes, who, it is somewhat singular, were mostly of foreign, generally of low-country extraction, have been, with few exceptions, restored to their lost dominions, but under such modifications as seem likely to prolong the necessary influence of the British government. The character of the inhabitants is the very reverse of being very amiable or very promising; but there is now a chance for their improvement, which neither their original condition nor their bondage under the Gorkhas could have afforded. This territory, as subdivided, has four principalities, and several lordships and petty chiefships. We shall notice only what is most important respecting them.

Cahlore, situate on both sides of the Sutuleje, is a pretty ancient principality, inhabited by a spirited and hardy race, who were formerly successful enough in their military enterprises to subject several of the neighbouring territories to their sway. Its capital, Belaspoor, is described as a regular well-built town, the houses of which, to the number of about 3000, consist of stone and mortar, and the streets of which are paved.

Hindoor, another principality, has long been at variance with Cahlore, though the rajahs of both are of one lineage.

Sirmore, the third principality, and one of considerable political value, from its vicinity to the plains, has for many years been governed by a race of Rajpoot princes, who came originally from Jesselmere. Its capital, Nahn or Nahan, in lat. 30° 31′, and long. 77° 13′, a populous open town, on the brow of a rock, was taken from the Gorkhas by the British in 1815, after a slight resistance.

Bussaher, the fourth principality, has for its capital Rampoor, which lies about 70 miles north of Nahan, and is reckoned the largest town in this hilly quarter. It is the chief mart for the goods of Tibet; and cloth, sugar, and cotton, are brought to it from the plains to be disposed of to the hill people.

Keonthul, the largest of the lordships, was established about A. D. 1000, by Rana Ketoo Sen, with whose descendants it remained for nearly 600 years. Several forts in it were dismantled by the Gorkhas.

The remaining lordships and chiefships are *Bughat*, which has five forts; *Baghul*, in which is the fort of Buheree, built by the Gorkhas; *Kothaur*, *Koomharsein; Bhugee*, containing the fort of Kungur, possessed by the raja of Cahlore; *Malogh*, with the fort of Timour; *Dhamee; Koonyar*; *Mungul; Arki*; *Joobul*, a district which has profited little by the generosity of the British, in consequence of the character of its people, and which probably will not long remain as a separate state; *Koteghur*; *Bulsun*; *Kunaitoo*; *Poondur*, a very imperfectly known, and apparently a barbarous community in the hills, never quite subdued by the Gorkhas, and now devolved to the British, in consequence of the want of a representative of the last chief; *Saugree*; *Morni*; *Jounsar*, the capital of which, Kalsee, is a place of some trade; *Bhawur*, connected with the preceding, and with it forming two pergunnahs; and *Roween*, a district whose position is not yet entirely decided on. The most recent information respecting several of the places now mentioned, and the people of these northern countries, will be found in Mr Fraser's Journal of a Tour through Part of the Himālā mountains.

2. Gurwal, or Garhawal, sometimes also called Serinagur, lies to the south-east of the preceding territory. Much of it is uncultivated and unpeopled, being either stony and barren or covered with forests. The southern parts are hilly, with few and inconsiderable vallies. The people, who generally derive their origin from some of the provinces to the south did not shew much spirit on the Gorkha invasion, to which, after a defeat, they submitted with an apathy quite in contrast with the love of independence that usually characterizes highlanders. This is the more singular, as their country has admirable means of defence against an enemy. Equal indifference seems to have been manifested when the British undertook the chastisement of the invaders, who had ruled with a full sense of their superiority; and, accordingly, this country may be deemed a fair conquest on the ordinary principles of war.

Serinagur, the capital of Gurwal, lies on the east bank of the river Alacananda, about 20 miles above its junction with the Bhagiruttee. It was formerly a place of some note, both from its extent and commerce; but has greatly suffered of late years, especially from an earthquake in 1803 and the invasion of the Gorkhas. Its houses are rudely constructed. The residence of the former rajahs is the largest in the place, and is built of granite to the height of four stories, but was probably never very splendid. Besides having a traffic in silver and specie, it is the mart for the produce of the adjoining hills, as lead, copper, drugs, wool, hemp, and fruits. *Deyhrah*, a town in the valley of Deyrah-Dhoon, is no longer of any consequence. The modern capital of the rajah of Gurwal is *Barahat*, the position of which is stated to be 20 miles from Serinagur. It is described in Mr Fraser's work as a most wretched place, of not more than five or six houses, surrounded with filth, and almost buried among nettles, thorns, and other weeds. It was once of more consequence, and is still reckoned a place of sanctity.

The fortress of *Kalunga*, situate in latitude 30° 20′, and longitude 78° 6′, is memorable for two repulses given the British forces sent to attack it. In the first of these, in October 1814, general Gillespie, who commanded the assault, met with his death. The second, on the 27th November, in the same year, occasioned a loss of three officers killed and eight wounded, with 38 killed and 440 wounded of the soldiers. The garrison, now greatly reduced, avoided a third attack, by abandoning the place a few days afterwards.

The history of the war, to which the two events now alluded to belong, is of high interest, as illustrative of the character of a people, who alone, of all the nations of Hindostan, can be allowed the title of fit antagonists to a British army. It may be permitted, therefore, to give an account of some of its chief features, so far as respects the places abovementioned. The causes of the war were stated in the proclamation of the British government, dated Lucknow, Nov. 1. 1814, which will be found in Mr Fraser's work. In the beginning of October 1814, the British troops were moved towards their alloted depots, and divided into four bodies under their respective generals, and having distinct services to perform. That under the brave but unfortunate officer who has been named, consisted of 3000 men, and was directed to undertake the siege of the forts in the valley of the Doyrah Dhoon, after succeeding in which, it was to endeavour to recover Serinagur, then in the possession of Ummr Singh Thappah, or to attempt the capture of Nahan, the capital of Sirmore, and then to advance towards the Sutulege, so as to cut off the son of that chief from the rest of his countrymen. It was the third division, and it began the eventful operations of the campaign by marching from Serampore, clearing the Timlee pass, and taking up a position about five miles from the fort of Kalunga, then garrisoned by 300 or 400 men, under the command of the nephew of Ummr Singh. A note, containing a summons of surrender, being sent to this intrepid governor, and received by him at midnight, was torn in pieces, and an answer to it was returned, stating the unseasonableness of the hour for such letters, and assuring the English officer, Lieut.-colonel Mawby of the 53d foot, acting as commander in the temporary absence of the general, that a visit would soon be paid him in his camp. On the following day the place was reconnoitred, and some trivial preparations were made for an assault, which, though commenced, was speedily relinquished as ineffectual.

On the arrival of general Gillespie, farther measures were taken for the same purpose. Fascines and gabions were prepared; two 12-pounders, four 6-pounders, and four 5½ inch howitzers were carried up the hill by means of elephants; the table-land on which the fort is raised was taken possession of without resistance, and the batteries were ready to open on the morning of the 31st October. The storming party was divided into four columns, and a body of reserve; the first consisted of 611 officers and men under colonel Carpenter, the second of 363 under captain Fast, the third of 541 under major Kelly, the fourth of 283 under captain Campbell, and the reserve of 939 under major Ludlow. The columns were so arranged and posted as to ascend, on the firing of a gun, from four different points, by which means it was hoped the attention of the enemy, who had taken all the precautions in his power, would be distracted. A well directed fire from the batteries proving less efficacious than was expected, is imagined to have induced the general to give the signal for assault some time earlier than had been originally intended, a circumstance which, from not being understood, prevented the consentaneous advance of all the columns, and probably occasioned the failure of the plan. The first column and the reserve alone moved forward, and with such determined bravery as to carry the stockades which surrounded the fort, and push on to its very walls, notwithstanding the spirited and very galling fire of the enemy. But here their success terminated, as the want of ladders, which had not been brought up in time, left the men exposed to unavailing hazard; and when at length this defect was remedied, the obstacles to ascent were found so great, in the position which had been taken, that it became necessary to attempt a retreat, which was not accomplished without material loss. The difficulty of this emergency was seen by the general, who, resolving on overcoming it, and not anticipating such formidable opposition, drew out three companies of the 53d regiment, at the head of which, while gallantly marching up towards a wicket, where a gun had been judiciously placed so as to enfilade the approach, and in the act of cheering his companions, he was shot through the heart. His aid-de-camp fell beside him, and many officers and men were wounded. This deplorable event decided the fate of the assault, as it now became impossible to rouse the men to the degree of courage requisite for its success; and it was deemed prudent by colonel Carpenter, the next in command, to call them off, and afterwards to retreat. The loss on this sad occasion, which was the first enterprise of the war with Nepaul, was severe, as, besides the general, four officers were killed and fifteen wounded, some of whom afterwards died; and of the non-commissioned officers and men, 27 were killed and 213 wounded. In addition to suffering from the fire of the fort, the assailants were annoyed, and sometimes severely wounded, by showers of arrows and stones,—in the discharge of the latter of which, it was observable that women were most undauntedly engaged.

This division of our army being at length aided by the arrival of a battering train, recommenced operations to assault Kalunga on the 25th November following; and, by the 27th of the same month, had effected a breach which was conceived to be fully practicable, so that another, and it was hoped better arranged against the fort, was immediately directed. The storming party, which consisted of all the grenadiers of the detachment, with two companies of the 53d regiment, under the command of major Ingleby, advanced to the breach, and for two hours sustained a tremendous fire from the fort; but, in spite of bravery and every exertion that could be made, was under the necessity of retreating without success. The conduct of the enemy, on this second occasion, was to the full as resolute and vigorous as on the former; but they appear to have experienced much greater loss, in consequence of the superior means employed against them. On the following day, the batteries were again opened upon them, and produced such terrible destruction, that the survivors, not exceeding 70 in number, thought proper to abandon the place on the night of the 30th, fighting their way through the posts planted to intercept them, and closely pursued by a party under major Ludlow. The awful effects of the artillery were not thoroughly known till the fort was taken possession of by the British, when the most shocking proofs of its power, as well as of the amazing hardihood of the enemy, were amply discovered. The place had the appearance of a slaughter-house, and the condition of the dead and the dying, both numerous, was utterly appalling to humanity.

But to turn from the picture which has been given of the scene by Mr Fraser, from whose details the preceding narrative is abridged, to a more agreeable subject, it may be proper to notice some of his commendations of the truly heroic behaviour and absolutely chivalrous magnanimity of the Gorkhas, as exemplified during this struggle. A high sense of duty, and a large share of native courage, were not their only virtues. They manifested a spirit of generosity, and a degree of esteem for their assailants, which would do honour to the most cultivated nation, and which were the more worthy of eulogium as they were presented during the pressure of a siege that might have been expected to have obliterated every feeling but that of hatred and revenge. The following remarks of Mr Fraser, and the incident which affords the illustration of them, richly deserve to be generally known as contrasts to the prevalent opinion respecting these highlanders. "Whatever the nature of the Gorkhas may have been found in other quarters, there was here no cruelty to wounded or to prisoners; no poisoned arrows were used; no wells or waters were poisoned; no rancorous revenge seemed to animate them: they fought us in fair conflict, like men; and, in the intervals of actual combat, showed us a liberal courtesy, worthy of a more enlightened people. So far from insulting the bodies of the dead and wounded, they permitted them to lie untouched till carried away; and none was stripped, as is too universally the case. The confidence they exhibited in the British officers was certainly flattering: they solicited and obtained surgical aid; and on one occasion this gave rise to a singular and interesting scene: While the batteries were playing, a man was perceived on the breach, advancing and waving his hand. The guns ceased firing for a while, and the man came into the batteries: he proved to be a Gorkha, whose lower jaw had been shattered by a cannon shot, and who came thus frankly to solicit assistance from his enemy. It is unnecessary to add, that it was instantly afforded. He recovered, and when discharged from the hospital, signified his desire to return to his corps to combat us again; exhibiting thus, through the whole, a strong sense of the value of generosity and courtesy in warfare, and also of his duty to his country,—separating completely in his own mind private and national feelings from each other,—and his frank confidence in the individuals of our nation, from the duty he owed his own to fight against us collectively."

Devaprayaga, signifying *union of the gods,* and so called from the junction of two rivers, is 12 miles west from Serinagur. It is noted for a temple held in great veneration by the Brahmins, though they can give no other account of it than that it was built 10,000 years ago. This place is one of the five principal *prayagas,* or holy junctions, spoken of in the Shastras. There are three more in this country; and the fifth is at Allahabad. Some of the sources of the Ganges are conceived to be in the northern parts of this province.

Near *Gangoutri* or Gungotree, 62 miles N. by E. from Serinagur, the Ganges bursts into day from a mound of snow. The place is much visited by devotees, who reckon a pilgrimage to it of vast efficacy in all the future stages of their transmigration.

Kedarnath is, like Gangoutri, in the Himalaya mountains, about 61 miles N. E. of Serinagur, and is noted for a temple.

Bhadrinath or Buddrinauth, situate in lat. 30° 43′, long. 79° 39′, on the west bank of the Alacananda, is still more reputed for sanctity, and is said to be visited by about 50,000 pilgrims annually. The temple there is of a conical shape and about 40 or 50 feet high, having a small cupola and a copper roof, over which is a gilded ball and spire. The chief idol of the same name, or Mahadeo, is described as cut out of a black stone, or marble, being three feet high, and dressed in a suit of gold and silver brocade, with its head and hands uncovered. This temple is immensely rich, having no fewer than 700 villages attached to it, which are conceived to form but the least part of its revenues—the donations of the pilgrims, or the taxes imposed on them, proving vastly more considerable. The high priest who officiates here, and most of the attendant Brahmins, are generally from the Deccan.

The places which have now been named, are of such consequence in the superstitions of the Hindoos, as to require to be spoken of at greater length than what is sufficient for an ordinary gazetteer notice. The following particulars respecting them are condensed from the observations of Messrs Webb, Hearsay, Raper, and Fraser.

This last gentleman is the first European who has visited Gangoutri; and his description of it, as well as of the adjoining country, forms one of the most interesting portions of his narrative. After referring to what he had said respecting the banks of the Jumna, as presenting several features of the grand and the beautiful in nature, he contrasts rather than compares with them those of the Bhagiruttee, which are much more wild and sublime. The former river runs in a level narrow bottom, the path to which leads through many well cultivated and pleasing valleys; but even at its source, where there is a rich assemblage of materials for a bold and an impressive landscape, the scene is no way so desart and stern as that of the bed of the Bhagiruttee, which being a far larger river, and descending from more lofty mountains, has worn deeper into the bowels of the earth, and made a much more haggard exposure. Here the rocks have a great variety of colour as they happen to be of different composition, which is made known by the violence of the water that has shivered them into pieces; and the absence of almost all the soft or the pleasing in vegetation, is in perfect though gloomy harmony with the sense of horror which such evidences of power are fitted to inspire. The country around for many miles partakes generally of the same character; and hence, without mentioning farther particulars, the reader may form some conception of the sort of difficulties which beset the access to Gangoutri, whither, after no small deliberation as to the route he should take, Mr Fraser proceeded on the 19th July 1815. Sundry regulations were made for this purpose previous to his leaving the village of Duralee, which is at the distance of a long day's journey from that sacred place. For example, he had to leave there all the Mahommedans who had accompanied his party; to consent to take with him no more than five persons with arms, all of which were to be laid aside when they came in sight of the holy spot; and to pledge himself that no life should be sacrificed for food until he returned. The precept, to perform this last stage with naked feet, was not enjoined on him, but he volunteered to put off his shoes when he entered the precincts of the temple and other holy places,—an offer which gave great satisfaction to his guide; while his Hindoo attendants were most ready of course to put it in practice, and accordingly went from the village barefoot.

The road lay at first through a wood of large firs, near the bed of the river, and was tolerably good, though it had occasionally some very bad passages. Then a curiously constructed flight of steps, made of beams of wood and stones stuck fast in fissures, conducted up the projection of a rock which obstructed the view, and near which the stream was closed in a deep, dark, and narrow chasm. The road, now more devious, and passing over enormous pieces of rock, brought the party to a retired spot beneath some trees, where pilgrims usually halted to rest themselves; after which it became still more difficult and unpleasant, till it reached a very ugly and hazardous descent that leads to Bhyram Ghauttee. Here the river divides into two branches, one retaining the name, the other having that of J,hannevie, and both of which run in deep chasms of indescribable ruggedness of aspect. Immediately above their junction there is a crazy wooden bridge thrown over the Bhagiruttee, and resting on two rocks, at an height of many feet from the stream, which foams and twists violently through a curiously wrought piece of solid granite, and leaps in fearful waves over every obstacle. The bed of the other branch is conceived to be as savage and picturesque as that of the Bhagiruttee; but Mr Fraser had not an opportunity of examining it to the same extent. At the end of the bridge there is an overhanging rock under which worship is paid to Bhyram, a god supposed to be represented by a black stone partly painted red. At this place prayers and other religious exercises, especially bathing, were performed, as preparatory to the more important ordinances to be observed at Gangoutri. Mr Fraser himself submitted to some of these rites. He bathed at the proper place, namely, the junction of the two streams, while a Brahmin prayed over him; and, during this, he had to hold a tuft of grass, which, at the conclusion of the prayer, he was directed to throw into the eddy occasioned by the meeting of the two waters. The spot where this ceremony was performed was a mere point of shingle, just under the rock which divides the two streams; and Mr Fraser found it necessary to be cautious in proceeding into the water, as it was exceedingly deep close to the shore; and, about two yards towards the middle, the stream became so rapid as to leave no chance of escape for any one that should be carried into it. The water was extremely cold, as may be imagined from its being entirely fresh snow water.

The next part of the path was found more difficult and dangerous than any yet passed, consisting of an artificial but very insecure and much decayed set of stairs, made of wood, like those formerly described, by which alone a high and an almost perpendicular rock was to be ascended. Even this contrivance was not applied to the whole space that had to be traversed; and it frequently became necessary either to leap from one point to another, so as to obtain firm footing, or to lay hold of a projecting ledge or a piece of overhanging bamboo, while a horrible gulph seemed to yawn below ready to receive the incautious and trembling adventurer. By and by the party reached a small temple dedicated to Bhyram, where they paid their respects; after which they proceeded along the north side of the river, through a path which seemed to increase in fearfulness, horror, and difficulties, as they advanced, both from the irregular nature of the ground, and the steepness of the hill face on which the road winded. Shapeless blocks of rock more completely obstructed the way, and, for hundreds of yards, the passengers had to clamber over them, heaped as they were one upon another in monstrous confusion, and at the same time so unsteady that they shook and moved under a man's weight. "So painful, indeed, is this tract," says Mr F. "that it might be conceived as meant to serve as a penance to the unfortunate pilgrims with bare feet, thus to prepare and render them more worthy for the special and conclusive act of piety they have in view as the object of their journey to these extreme wilds."

A place called Goureecounda, at the distance of a gunshot from Gangoutri, where a rapid stream joins the Bhagiruttee, is also holy; and here accordingly another ablution was performed. Below it the river falls over a rock of considerable height, and forms a succession of cascades; and above the junction of these streams, the bed of the latter widens into a small shingly space, where the river rolls rapidly. Shortly afterwards was found a bridge consisting of beams stretching across and resting on a large rock in the centre; and a little from the bridge, fifteen feet above the stream, is the small temple dedicated to the goddess Gunga or Bhagiruttee. It was erected by one of the Gorkha conquerors, a piece of service which, it is imagined, is not peculiarly grateful to the goddess, who is thought to have been content with the simple worship that had formerly been rendered at her own natural shrine. In this respect Gangoutri differs apparently from several other holy places in Hindostan, and particularly from Kedarnauth and Bhadrinath, for notwithstanding the number of donations which have been made to it during so many centuries, little or no provision has been appointed for the erection of temples in or about it; whereas in them, on the contrary, places of worship have been frequently raised from funds specially bequeathed for the purpose. Mr F. conceives this peculiarity to be the result of some superstitious prohibition, and not to have arisen from neglect. The temple stands on the sacred stone on which Bhagiruttee used to worship Mahadeo, and is a square building about twelve feet high, rounded in at the top in the common form of a pagoda. It is perfectly plain, painted white, with red mouldings, and surmounted with some melon-shaped ornaments. The eastern face of the building is turned nearly to the sacred source, and has a small projection, covered with a stone-roof, in which is the entrance that fronts the east, and just opposite to which there is a small temple of a pagoda-shape dedicated to Bhyramjee. A wall of unhewn stone surrounds the building; and the intermediate space, which is paved with flat stones, contains a comfortable, though a small house, for the accommodation of the officiating Brahmins. Two or three wooden sheds on the outside of this inclosure, are intended for the reception of pilgrims, some of whom are nevertheless obliged to take shelter in certain caves formed by overhanging stones. The scenery of the place is so awfully grand as to have impressed Mr F. with the idea of its being like the dark and dangerous pass to the centre of the ruins of a former world. Bare and peaked cliffs, shooting upwards, equalled in ruggedness and elevation any which he had previously seen; wild chaotic masses lay scattered at their feet; while a scanty garb of wood imperfectly relieved their nakedness. The prospect was closed on all sides, except in front to the eastward; where, from behind a mass of bare spires, there arose the four huge, lofty, snowy peaks of Boodroo-Himālā, which gave the finest possible finishing to the scene. The approach to it is through a labyrinth of enormous shapeless masses of granite. These have fallen from the cliffs, which seem to frown over the temple, and which, in all probability, will one day bury it in ruins. Around the enclosure, and among those masses, for some distance up the mountain, a few old pine-trees yielded a dark shade, and formed a magnificent fore-ground; while the river ran impetuously over its shingly bed, and the sound of the stones which it rolled along with it mixed with the roar of its waters.

It is a common opinion of the Hindoos, that no mortal has gone, or can go farther towards the source of the river than this point. Mr F. made the attempt; but after having, with considerable difficulty, and at very great hazard, found his way over unsteady fragments for some hundred yards, was forced to turn back, and thus verify the prevalent belief. Still he inclines to think that it might be possible, in particular seasons, and by particular management, to get somewhat beyond the termination of his own enterprise, though certainly not without danger, nor without the assistance of persons whose religious prejudices are opposed to the undertaking. In the failure of his own attempt he was obliged to content himself with the report of his pundits, that the source is not more than five miles horizontal distance from the temple, and nearly in a south-east direction. And this very report, it is obvious, implies the possibility of obtaining information on the subject, though not by the course which Mr F. had taken. He made mention to the same individual of the far-famed story of the Ganges issuing from a rock like a cow's mouth, but found it was laughed at; whence its falsity may be safely affirmed, as it is certain that the love of the marvellous, and a disposition to exaggerate whatever is really remarkable in an object of such veneration, would have readily sanctioned the vulgar belief, if there were any appearance that in the slightest degree could warrant it. On occasion of his visit to Gangoutri, as before during his journey to it, our countryman conformed to the prescribed ritual. He bathed in the holy spot where the goddess used to stand, and found the water so piercingly cold that it required no small effort of piety to stay long enough in it for the Brahmin to say the usual prayers over the pilgrims. He held in his hand, as formerly, a small tuft of grass, which he threw into the stream on the prayer ceasing; after which he went barefoot into the temple, where worship was performed, a little bell ringing all the time. Presents were then made, and all parties seemed fully satisfied. Within the temple were three images, placed on an elevated stone shelf, which was wet and soiled with the offerings. He observed a peculiar smell in it; but knew not whence it proceeded. The place was lighted by a small lamp, and no day-light was admitted. "It was matter of serious importance," he concludes, "as well as of great joy to every one, that we had thus happily reached a place of such supereminent sanctity; such, indeed, that the act of bathing here is supposed to cleanse from every sin heretofore committed, and the difficulty of which is so great, that few, except professional devotees, ever attempt reaching the holy place."

Though Gangoutri is the source of the most sacred branch of the Ganges, and therefore holds the first rank among the holy places of Hindostan, its shrine, from the difficulty of access to it, of which some idea has now been attempted to be conveyed, is not the most frequented by pilgrims, who flock in much greater numbers to Bhadrinath. This place is situate on the west bank of the Alacananda, in the centre of a valley, the east bank of which is considerably higher than the west, and rises to a level with the top of the sanctuary. Two lofty mountains, called Nar and Narayena, at equal distances from the temple, the former to the east and the latter to the west, are covered with snow from top to bottom. The town does not contain above 20 or 30 huts, which are inhabited by the Brahmins and other attendants of the deity; and the temple itself, which occupies the upper part of it, is, in point of appearance, much inferior to the expectations naturally formed of so celebrated an edifice, and by no means does justice to the immense sums of money bestowed for its support. But comparatively mean as it may be thought, it is conceived to be the workmanship of a being more than human, though its supernatural origin and holy character have not afforded it sufficient protection against the shock of an earthquake, by which it was so greatly injured as to require the intervention of mortals to prevent its utter ruin. One consequence of this interference is the production of a modern look, which is quite at variance with its boasted antiquity. Our countrymen not gaining immediate entrance into it, had an opportunity of surveying the baths, the cold and hot springs, and other peculiarities in its vicinity, of which it is enough to say, that they are all in some degree connected with the religious ceremonies of the place. The arrival of the Rauhil, or high priest, who was to introduce the party into the presence of the sacred image, being announced, a cloth was spread for them, and a China silk carpet for his holiness, who was preceded, accompanied, and followed by the proper subordinates. His dress was fantastically rich: He had on a quilted vest of green satin, with a white shawl; a red turban on his head, and a pair of party-coloured socks on his feet. From his ears hung a couple of large golden rings, attached to each of which was a large and handsome pearl; his neck was encircled with a triple string of small pearls; bracelets, consisting of precious stones, ornamented his arms; and on most of his fingers were golden rings, studded with brilliant gems. Salutations and a short conversation being ended, he signified his readiness to conduct the party to the sanctuary, to which they accordingly proceeded. At the outward portico they were directed to take off their shoes, after which they ascended a few steps, and, passing through a small door, arrived at the area of the temple. About 20 feet farther was a vestibule, raised about a foot and a half from the terrace, and divided into two apartments, the innermost of which was somewhat more elevated, and adjoined the sanctuary. From the roof of the outer one were suspended bells for the use of the devout visitants, none of whom is permitted to go beyond it. Our countrymen were not allowed to go so far; but having taken their station in front of the image, a few paces from the outer threshold, they had a perspective view of the sacred repository.

Bhadrinath, the chief idol, dressed as formerly mentioned, was fixed opposite the door, at the extremity of the place; over his head there was a small mirror which reflected the objects from the outside, and in front of him were two or three lamps, which gave all the light that was in the apartment, except what obtained entrance by the door, and which shed so feeble a glare that objects could not be clearly discerned. Below the idol was a table or board, covered with a cloth of gold and silver brocade, like his own suit, and calculated, by its glittering appearance, to give the spectator an idea of magnificence; though it is not an injudicious surmise on the part of the narrator, that the gloom of the place may have been artfully contrived to give a fictitious and delusive value to very paltry substances. The obscurity might serve, moreover, to nourish and augment the solemn feelings of the superstitious worshippers. The image is conjectured, for the sort of light prevented any thing like a correct estimate, to be about three feet high, and is said to be cut out of black stone or marble, but only its head and hands were uncovered. To the right of the principal deity were the images of Udd'hara, Nar, and Narayena; and to the left those of Cuwera and Nareda. On signifying a wish to depart, a large silver salver was brought towards the party, and held out in order to receive any offering they might be disposed to make, and which was probably expected to be a very liberal one, from the marked attention that had been showed them. A hundred rupees were deposited, and our countrymen took leave "without absolution or remission." The Mahommedan servants who attended them were prohibited from approaching the spot; and it had been particularly enjoined, that no creature used for food should be deprived of life within the precincts of the temple, a large stone on the opposite side of the river being pointed out for the purpose of slaughtering any animal that might be required by the party.

The temple of Bhadrinath has more beneficed land attached to it, much in the manner of some of our own religious endowments, than any sacred establishment in this part of Hindostan; and all its possessions are under the jurisdiction of the high priest, whose authority is at least nominally independent of the ruling power, which, indeed, would not find its advantage in violating any of his rights. Formerly this office was confined to a particular caste of the Brahmins; but, since the Gorkha conquest, it has been generally disposed of by sale to the highest bidder.

Those who frequent this shrine are expected to make offerings to the deity proportioned to their ability; and the wealth thus arising is conceived to be superior to that of the territorial revenue; but it is not unusual for persons, whose devotion leads them here, to assume an aspect of poverty, under which they may accomplish the object of their pilgrimage, and at the same time indulge their covetousness; while some, much more conscientious and fuller of zeal, do not hesitate to lay the whole of their substance at the feet of the idol, and afterwards trust to the liberality of others. In return for the oblations made to the idol, each devotee is presented with a presād, which, in reality, is simply a little boiled rice; but if this be thought a trivial remuneration, the promises which are given as to futurity are ample enough to satisfy the longing worshippers who are so stupid as thus to purchase and believe them. As our countrymen were not of this number they received none; but the high priest, wishing to compliment them, made them several presents, some of which were considered to be special marks of favour.

The temple is kept open from daybreak till one or two o'clock, when the deity is said to take his dinner; and it is again opened from sunset till a late hour, when, with equal accommodation to human necessities, he goes to rest in a bed laid out for him. The vessels in which he is served are of gold and silver; and the expenses of his table establishment are very considerable, which is not to be wondered at, for he has a great number of servants. Such, then, is the liberal mode of treating him during the summer months, that he can have no reason to complain; but his fare during winter, when no pilgrims are looked for, is less generous, though equally politic. His attendants then find it convenient to go elsewhere, and as in this case it is not imagined that he can be in want of any thing, he is left to his own meditations.

The Brahmins who reside at this place usually come from a distance, and are induced to do so by the hopes of sharing in the fees of the pilgrims. They are enjoined a peculiar abstinence during their continuance at it; but this restriction is, perhaps, one of the causes of their greater profligacy on returning to Jōsēmatha, where it is removed; and the circumstance of some of them having applied to our countrymen for advice and remedy in a certain disorder, gave rise to a very likely opinion,—that the embroidered idol of Bhadrinath was not the only little deity at whose shrine they paid their devotions. The high priest himself, a man about thirty-two years of age, was the very first of these patients; but he, poor fellow, had innocently enough, according to his own account, acquired the complaint from a particular condition of the atmosphere!

The immense number of pilgrims who come to Bhadrinath, and the largest portion consists of fakirs from the greatest distances, commonly assemble at Haridwar, whence they take their departure at a particular season for the holy land, proceeding by Devaprayaga to Rudraprayaga, and thence to Kedarnath. This last place, which is next in importance to Bhadrinath, lies 14 or 15 miles to the west north-west of it, in a direct line; but as the intermediate hills are inaccessible from snow, the pilgrims take a circuitous route of eight or nine days by Jōsēmatha; and such, indeed, are the difficulties of this road, and the severity of the weather sometimes experienced in it, that two or three hundred persons are known to have perished in the journey during a single year. The ceremonies performed at Kedarnath, are precisely the same as those required at the former holy place, and consist chiefly of ablution in certain springs or baths, and the operation of shaving. They are easily performed in the course of one day, and few persons think of remaining more than a day longer, when they proceed to the rest of their pilgrimage, which is completed by their taking the course of Nandprayaga and Camprayaga. Kedarnath is said never to have been entered by Europeans, not on account of the difficulty of reaching it, but because two, at least, of the other holy places, are more remarkable, and time would be uselessly lost in paying it a visit.

Such, then, are the places of most repute for sanctity in this country; but there are multitudes of shrines of less note, as almost every village has its temple, and every considerable mountain its deity, to whom the neighbouring inhabitants think it is their duty, and to their advantage, to pay their devotion.

3. *Kumaon*, properly speaking, forms a part of Gurwal, and was at one time connected with it. The district now so called, and as regulated since the British conquest in 1815, is the tract of country between the Ganges and the Cali, from the plains to the highest peak of the Himalaya, a space including part of old Gurwal. It is divided on the east from Nepaul by the Cali, and is reckoned to be about 7000 square miles in extent The people, who are mild and inoffensive in temper and disposition, differ in manner and appearance from those of Gurwal, and are thought to be on the whole inferior in strength, and more effeminate. But they are probably more numerous; and they seem to have paid more attention to the improvement of the land. The abundance of streams which descend from the mountains enables them to cultivate rice successfully in the vallies, almost independently of the seasons; while the higher lands yield wheat, barley, and other grains. There is a good deal of useful timber in the country, and some of the metals are found in tolerable quantity among the mountains. A dwarfish breed of oxen inhabits the hills; the horse is unknown to them; the other animals are common to Kumaon and the adjacent countries. When the Gorkhas made their invasion, they shewed unusual favour to this province, owing, it is believed, to the great numbers of Brahmins residing in it, whom they respected; and to whom, probably, must be ascribed the comparatively virtuous character of the people. Since its occupation by the British, Kumaon has enjoyed profound tranquillity, and seems to have readily conformed to the change of government.

Almora, the modern capital, in latitude 29° 35′, longitude 79° 44′, stands on the ridge of a mountain 5792 feet above the level of the sea. It contains about 1000 houses, which are scattered on the sides of the mountain.

Chumpwit, the ancient capital, lies 16 miles south-east from Almora.

Niti, a village in latitude 30° 47′, longitude 79° 56′, is at the pass called *Niti-ghaut*, which leads from Northern Hindostan into Tibet. It was by this that Captain Webb, in the character of a merchant, proceeded towards Deba, the nearest town under the government of the Chinese, in hopes of being allowed to advance to the banks of the Sutuleje near its head,—an enterprise which was frustrated by their wonted jealousy.

4. *Nepaul*, one of the largest independent states in Hindostan, extends from Kumaon on the west to the river Mitchee and the territory of Sikkim on the east; and from Tibet on the north, where it is bounded by the Himalaya mountains, to the provinces of Oude, Bahar, and Bengal, in the south,—a space nearly 500 miles long and upwards of 100 broad. Such are the present limits of the Nepaulese dominions, which were more considerable previous to the contest with the British government; as, on the other hand, the name of Nepaul, properly speaking, applies only to a small part of what has now been defined, and which is also sometimes denominated the valley of Lahuri, or Nepaul Proper, being the country in the neighbourhood of Catmandoo, the capital of the kingdom. Dr Hamilton, whose recent work on Nepaul has added materially to our acquaintance with the country, treats of it in a still more extended sense; and as much of what is described by him, and some others on the subject, relates generally to the state of Northern Hindostan,

it may be proper, in the first instance, to extend our view beyond the specialties of the kingdom.

According to the author now mentioned, then, this country is divisible into four regions. The first, or southern region, is a district or border of the great plain of Hindostan, reaching, in some places, to the breadth of 20 miles, and differing from the portions of the British territory adjoining to it, only in being more woody, and having undergone less cultivation. It is in consequence better stocked with wild beasts, among which are the elephant and rhinoceros. Owing to the same cause, probably, it is somewhat unhealthy,—the number of decayed leaves and other vegetable products occasioning bad air, especially in the dry season; and to this may be added, as an objection to it, that it is scantily supplied with good water. The second region, and which lies to the north of this plain, is a district of nearly equal breadth, that consists of small hills, the lower parts of which to the south are much covered with the Sal or Saul forests, as the upper abound in trees of the pine and mimosa families,—the abode of numerous birds, which are considered as property by the rajah, and are actually farmed as such. The third district, and which is also the most important, is very elevated, and appears composed of mountains heaped on one another, but separated by narrow vallies, which are consequently of various heighths, and therefore differ not a little in their vegetable products. Thus, some abound in bamboos and rattans, while others bear the oak and the pine; some again allow the growth of the sugar cane and the pine-apple; whereas a fourth kind can only furnish barley and some other grains. This part of the country seems to have granite for its geological basis; and it occasionally displays some of the inferior metals, gold being never found in it, except in the channels of the rivers, which carry it down from the higher region. It is in this district that the valley of Nepaul is situate, and which is the most extensive to be met with in the Nepaulese dominions. The fourth and most northern zone, called by Dr Hamilton the Alpine region, comprehends a space of 30 or 40 miles breadth, and is composed of immense mountains covered with perpetual snow, and but rarely intersected with extremely narrow slips of valleys, very few of which admit of cultivation. These mountains, it will at once be understood, form part of the great Himalaya range. Their southern declivities afford nourishment to a small breed of cattle, the tails of which form the Chaungri of India, and those appendages which designate the rank of Turkish bashaws. It is here, too, that are found four species of those tuberous plants the Bish or Bikh, one of which is among the most active of the poisons of the vegetable kingdom.

The present inhabitants of Nepaul, taken in the larger sense, are made up of various tribes, whose history is both obscure and uninteresting. They probably advanced from the south, as they retain, though with material modifications, the Hindoo superstitions, and as the princes or chiefs commonly claim Hindoo extraction. But in proof of their deviating from the purity of Hindoo faith, may be mentioned their worship of Buddha, and their having no scruple to eat animal food. Such indeed is their fondness of it, that, according to Dr Hamilton, even their Rajpoots would drink the blood of the sacrifices as it flowed from the veins of the victim, to the utter amazement of the low country people. Notwithstanding their pretensions, it is highly probable, from the features of their descendants, that the original inhabitants were of the Tartar or Chinese race. Some of the names of the tribes, which are still preserved, may be mentioned, as the Magars, Gurungs, Newars, Murmirs, Kirauts, Lapchas, and Bhooteas. The country was variously divided among them; and thus we find parts of it denominated the country of the twenty-four and the country of the twenty-two Rajas, whilst another part was held by twelve chiefs of an inferior degree, styled Ranas, Ranus, or Thakurs. Their consequence materially depended on the abilities and enterprise of their respective leaders; and consequently frequent changes occurred in their relative power and influence. In course of time, the tribe of the Newars rose to high distinction, from their greater advancement in civilization and the useful arts. This progress was perhaps owing, among other circumstances, to their possessing one of the most fertile spots in Nepaul Proper, where their principal cities were built. But about the middle of last century, another family, that of Gorkha, originally, it is conceived, of the Magar tribe, and long one of the weakest of the mountaineers, gained the ascendancy, chiefly, it would appear, from its ruling prince, Prithwi Narayan, a man of much energy of character, happening to be called on for his aid in behalf of one of the Newars against a rival, which he gave so effectually as to lead to an event totally unlooked for by all the parties,—the establishment of his people, the Gorkhalese or Gorkhas, as the predominant power in Nepaul. He adopted for his capital Catmandoo, one of the chief towns in the country which submitted to his arms; became known throughout India by the title of Raja of Nepaul; he died in 1771, and was succeeded by his descendants, who have proved themselves fit representatives of this conqueror. Their government, which is entirely military, was so effective, as at one time to have occasioned more real cause of solicitude to the British than could have been anticipated from any state in India. Differences could scarcely fail to arise between them and the Company, and these were the more important to the latter as Nepaul formed the chief security on that side against the Chinese, who might possibly have been induced to take part with the mountaineers. Great caution was thought required to avoid offence in any negotiations which took place; but this was probably imputed by the Nepaulese to a sense of fear, of which they had every disposition to avail themselves. The over considerate and lenient government of Lord Minto, in reality, was calculated neither to intimidate nor to satisfy them; and on his successor, the Marquis of Hastings, devolved the imperious duty of adducing more potent arguments for their consideration. The progress of the war disclosed a resolution and an intensity of resistance, on the part of the enemy, which could not have been looked for by any one who judged of them from former specimens of Indian hardihood. Two campaigns elapsed which would have been creditable to any combatants, ere the superiority of the British was decisively acknowledged. The consequences were a dismemberment, to the amount of a third, of the Nepaulese dominions; the cession of several forts and passes; the re-establishment of some subjugated chiefs; and the important stipulation, usually insisted on at the termination of hostilities in this region, that agents from the contracting parties should reside at the opposite courts. Strong expectations have been entertained of the security and advantages of this peace; but it would not be easy to obtain a pledge for their being realized.

Catmandoo, the capital of Nepaul Proper, and the residence of the Gorkha raja, is in lat. 27° 42′, long. 85°, and elevated 4784 feet above the plain of Bengal. Its inhabitants are numbered at 20,000, whose houses, constructed of brick and tile, are rather mean in appearance, and their streets very defective as to cleanliness. The raja's palace is a large building, but has no pretensions to magnificence or beauty.

Lalita Patan, within two miles of the capital, has more inhabitants, and is the most extensive town in the valley.

Bhatgong, formerly the seat of an independent chief, lies eight miles E. by S. of Catmandoo. It is on the whole a well built town, and is the favourite abode of the Brahmins. Its population is stated to be 12,000.

Kirthipoor, a town containing 6000 people, six miles W.S.W. from Catmandoo, made so vigorous a defence against the Gorkha conqueror Prithwi Narayan in 1768, that, on his obtaining possession of it, he inhumanly gave an order to cut off the noses of all the survivors, which was faithfully executed without respect to age or sex.

The country of the 24 rajas lies immediately to the west of Nepaul Proper. The chiefs, though thus nominally united, were never all organized into any common alliance; but leagues among two or more of them, for the purpose of defence, have been frequent. Few particulars concerning them deserve notice; and of the country of the 22 rajas, still less appears to be known.

Gorkha, the first of the former, and that which has given masters to Nepaul, has a town of the same name for the capital, situated in latitude 27° 52′, long. 84° 22′. It contains about 2000 houses, and has a temple.

Chinachin, the capital of Jemlah, or Gumila, one of the latter, lies in lat. 29° 13′, long. 81° 15′. It is a large place; has two temples dedicated to Siva; and carries on some trade.

Muckwanpoor, an extensive and important district in the lower country of Nepaul, has a strong fortress of the same name, planted on a hill about 17 miles south from Catmandoo.

The territory of Morung once belonged to the preceding.

Several districts on the southern border of Nepaul, or in what has been termed the first region, called also the Terriani, are now so broken in upon or infringed by the British possessions, that it is difficult to draw the line of demarkation between them. It will be singular if any arrangement on the subject be long preserved; and hence, supposing there were no other reasons for variance, the permanence of the peace beteen the two powers may well be doubted.

5. The principality of *Sikkim*, as now connected with the British government, is divided from Nepaul on the west by the river Conki, and from Bootan on the east by a branch of the Teesta, and has the Himalaya on the north, Morung and part of Bengal on the south. It is reckoned 60 miles long and 40 broad. Its inhabitants belong chiefly to the Lapcha tribe; but they have chosen a native of Tibet for their prince, and retain little of the Hindoo in their religious practices. They joined readily with the British against the Gorkhas, and, by so doing, occasioned some jealousy in their Chinese neighbours, who are by no means easy at our countrymen coming so close to their empire. One of the most important places in Sikkim is the fortress of Naggree, in lat. 26° 56′, long. 88° 8′, the cession of which to the British was no ordinary sacrifice on the part of the Gorkhas.

These are all the countries of Northern Hindostan of which we think it necessary to treat in this place.

Hindostan Proper.—We now proceed to describe the second grand division of Hindostan, and commence with,

1. *Bengal.*—This important province, which is the eastern extremity of Hindostan, lies between the 21st and 27th degrees of north latitude, and between the 86th and 93d degrees of east longitude, forming a space about 350 miles long and 300 broad. It has the Birman dominions on the east; Bootan, Sikkim, and Nepaul on the north; the province of Bahar on the west; and the bay of its own name on the south. Generally speaking, it is a flat country, more elevated towards the north, where it joins with the former division, than in the south, where the immense waters by which it is pervaded have their outlet in the ocean. Besides comprehending the trunk of the Ganges, it is intersected by various streams, most of which are branches of that mighty river; but the courses of these, so far from being permanent, as in the case of most rivers, are liable to variation, owing to the loose nature of the soil and the flatness of the country. Much inconvenience, and considerable losses, are the consequences of their deviations, which are frequent and sudden. In addition to what has been said of the Ganges, in the order of this work, may be mentioned a few particulars, which go far to determine its comparative amplitude. The quantity of water discharged by it during the dry season has been estimated at 80,000 cubic feet *per second*; and during the wet season, when it is full, at 405,000; or on an average through the year, at nearly 180,000. As an evidence of the quantity of sand and soil deposited by it at certain periods, it is related, that, in the year 1794, one of the mouths of the Hooghly, the river which forms the port of Calcutta, and is the only branch of the Ganges that is navigable for ships, fully five miles in length, was filled up in the course of a week to nearly the level of the adjacent country,—a space which must have been equal to at least 900,000,000 solid feet. In its course in the plains there are eleven rivers which run

into the Ganges, some of which are equal to the Rhine, and none smaller than the Thames. The narrowest of them have many turnings and windings; but the larger generally run in a pretty straight direction. Of the Brahmapootra, the largest river in India, though neither the most sacred nor the best known, we have elsewhere spoken. It is remarkable that this river should hardly have been mentioned by Europeans till about the middle of last century.

The winds which prevail in Bengal are chiefly north and south, which blow alternately, but unequally, during the year. The seasons, usually denominated the cold, the hot, and the rainy, are materially related to these changes. Storms of thunder and lightning, with rain and wind, coming from the north-west, are frequent about the beginning of April, and particularly towards the close of the day. If the periodical rains, which usually come on with the month of June, cease or moderate greatly in the early part of September, the weather becomes excessively hot, and very injurious to health, especially that of strangers. During the first two months of the wet season the rain falls heavily, and almost without intermission, and the rivers continue increasing. It is less constant in the succeeding two; and the inundation begins to drain off at the approach of winter. Thick fogs are prevalent at certain periods, the consequence of evaporation from an immense surface of water or moist earth.

The soil of Bengal, being almost wholly alluvial, and containing various salts and decayed vegetable matter, is of great fertility; nor are the natives, on the whole, inattentive to its culture, where the hand of industry is required to direct its productive powers. Rice is their main crop, but other grains and pulse in variety are also largely grown. Tobacco, sugar, cotton, indigo, the mulberry, and the poppy, attract well merited regard, as affording the materials of commerce. The use of the plough, which is drawn by oxen, is well understood; and the sickle is exclusively employed to cut down the harvest. All the common trades that are needed in the country are carried on in a tolerably effective manner, though the tools of the workmen are generally rude. As the population is abundant, wages are low; but fortunately the necessaries of life are of easy acquisition, as, besides the fertility of the land, the rivers are well stocked with different kinds of fish, which are so easily taken that the poor natives are apt to contract diseases from too free indulgence in the use of them. It is disadvantageous to the agriculture of this country, as well as to its progress in the arts, that the same individuals engage in the occupations of husbandry and the practice of some trade. By this means time is lost, and the attention so much divided, that excellence in any one particular is rendered more rare of attainment. But there are certain manufactures, as is well known, which they have carried on to great perfection;—plain and flowered muslins; calicoes and dimities; gauze and brocade; plain and fancy silks. These form a large export trade, over and above what arises from the disposal of raw materials or simply prepared goods, as hemp and flax, cotton and silk, sugar, the grains, drugs and gums, dye-stuff and pigments, oils, and hides. In lieu of these, Bengal imports the metals and bullion, woollen goods, naval and military stores, and many other productions and manufactures of Europe, and a great variety of substances from the provinces and states in its own neighbourhood, with which it maintains an extensive commercial intercourse. The facilities for transportation by water are so great in Bengal, that its internal trade is very considerable, and employs many vessels and a large proportion of the people. But, for the same reason, equal attention has not been paid to the construction of roads and highways. The circulating medium of commerce is chiefly silver and the shells called cowries,—gold now seldom appearing, though at one time abundant, and copper never having been introduced in currency. No uniformity of weights and measures is established, and the inconvenience attendant on their variety, to say nothing of the frauds that are so readily practised in consequence, is seriously felt.

On the subject of the population of Bengal, it has been found extremely difficult to arrive at any satisfactory conclusion, and the authorities are greatly at variance. Previous to 1801, the estimates that had been made were derived from sources which admitted great inaccuracies; but they were such as the prejudices and habits of the people allowed. In 1772, Lord Clive reckoned the whole population of British India, which then comprehended only Bengal and Bahar, at 20,000,000 of souls; in 1789, Sir William Jones computed them at 24,000,000; in 1790, they were estimated at 32,987,000, an amount thought unworthy of regard at the time, but which appears to have been confirmed by recent inquiries; and in 1793, Mr Colebrook decided that it could not be less than 27,000,000. The Marquis Wellesly, then governor-general, issued instructions in 1801 with a view to ascertain the point, but the returns to these are believed to have fallen greatly short of the amount, as the subsequent labours of Dr Francis Buchanan and Mr Bayley, which are held to be entitled to the highest authority, have demonstrated. According to them, the population of Bengal alone would amount to upwards of 25,000,000, while that of Bahar and Benares, included, as already said, in some of the former statements, is within a trifle of 14,000,000,—making in all, therefore, the population of what are called the old provinces 39,679,150.

Of *Calcutta*, the capital, and *Dacca*, the second city in respect of magnitude, we have elsewhere treated at some length. But as so many of our countrymen reside in the former, a few additional particulars, chiefly relative to the state of society in it, may prove agreeable to most readers. The hours of rising are early, as the cool air of the morning is peculiarly agreeable in so hot a climate. A meal, called tiffin, is usually taken between one and two o'clock, after which it is customary to go to bed for a short time. Dinner is deferred till after sunset, the time of exercise or recreation, which is commonly that of riding in carriages, where they can be afforded, or visiting in palanquins, being intermediate, and, consequently, after darkness has approached. The prevalent style of living among the genteel and wealthy is what would be called sumptuous and even magnificent in Britain; and the feasts given by the governors-general and principal officers, all of whom have their stated days of seeing company, are in the highest degree of liberality and splendour. But, besides these, there is a great deal of more private though still extensive entertainments, particularly during the cold season, to the joys of which, though, it is to be feared, not the safety, the immense variety of native and foreign luxuries and delicacies in the way of eating and drinking contributes. Altogether, then, so far as these are concerned, the society of Calcutta is sufficiently enticing; but, it would be unfair not to add, that it has recommendations of a higher character. The manners of the Europeans are generally agreeable, because those who go out have been in circumstances which admitted and required a due regard to the civilities and embellishments of life, and because a sense of their distance from home, in which they all share, imparts a common sympathy to their affections. Nor is it to be omitted, that some of the more substantial charities which truly enoble our race are commonly displayed here in a remarkable degree. In proof of this may be noticed, the readiness and liberality with which subscriptions are raised in behalf of the wives and children of those officers who die in the country. One of the great evils to be dreaded by new-comers, is the temptation to a mode of living which the allowances of the company, though undoubtedly large as compared with those of any other service, are inadequate to maintain; and one of the delusions against which it is worth while to guard such of our countrymen as may be anxious to go out to India, is imagining, as has often been done, that fortunes are much more easily made in it than elsewhere. With respect to the effects of the climate of India on European constitutions, it may be briefly remarked that, though certain diseases are prevalent here as in other hot countries, attention to diet and regimen, and a strict practice of the virtues of moderation and temperance have been found so serviceable in preserving the health, as to render the loss of it far more a matter of animadversion than was long imagined. It is now admitted, in reality, that, excepting in the case of some peculiar habits, and from a course of mismanagement, which it is both practicable and honourable to avoid, the average of mortality *need* not, and actually does not, so greatly exceed what is established in other regions, as to warrant applying the epithet unhealthy to the country or climate.

The various districts of Bengal may be thus summarily discussed, beginning with the southern part. The Sunderbunds, a marshy and woody tract, extending along the bay of Bengal, to the amount, with Cooch, Bahar, and Rangamatty, of 37,549 square miles, every where pervaded with rivers and salt water creeks, which permit the freest navigation throughout,—the residence of wild beasts rather than human beings, properly belonging to no individuals, but pertaining to the government, has hitherto resisted all attempts towards improvement, and has proved much more a source of vexation and injury than of revenue or other benefit to the British. Sagor island, on the east side of Hooghly river, formerly inhabited, and still a place held sacred by the Hindoos, who make pilgrimages to it, but, from want of sufficient encouragement to cultivation, become totally unprofitable, has lately been leased out to an association from whom it may be expected to receive an attention commensurate to its extent and apparent capabilities. Backergunge, a district lying chiefly on the western bank of the Puddah or Great Ganges, and contiguous to the Sunderbunds, is a level country, very capable of culture, with a population of more than 900,000 souls,—many of whom reside in boats throughout the year, and many of whom are little better than common thieves. Its chief towns are, a place of the same name, and *Burrishol*, now the head station of the district. Jessore district lies between the 22d and 24th degrees of latitude, having the Great Ganges on the north, the sea on the south, Nuddea and Hooghly on the west, and Dacca Jelalpoor, and Backergunge on the east. Much of it is so very low as to require embankments to prevent inundation; it has a rich soil peculiarly fitted for the culture of rice, but greatly neglected by the inhabitants. It readily produces indigo, tobacco, the mulberry, long pepper, besides salt and several other articles, which constitute materials for a good trade. Gang-robbery, or dacoity, formerly frequent here, as in other divisions of Bengal, has become far less prevalent of late years—one decisive indication of improvement. Its chief towns are *Jessore*, *Culna*, and *Mahmudpoor*.

Hooghly, now partly pointed out, has Midnapoor on the west, Burdwan and Kishenagur on the north, and the sea on the south. It is a low flat land throughout, very fertile, in an improving condition, has a considerable inland navigation, and contains about a million of people. The town so called, and which is 26 miles above Calcutta, is very ancient, was of great consequence during the Mogul empire, and, though declined, is still an important place. *Keerpoy*, *Hidjellee*, *Tumlook*, and *Chandercona*, are towns of some note in this district. The Jungle Mahals district has hitherto scarcely attracted notice, and has been reckoned almost a waste, though some circumstances promise to belie this opinion. The district of the twenty-four Pergunnahs, on the east of the Hooghly river, is of about 882 square miles extent, advancing with rapidity to a high state of cultivation, and containing upwards of two millions of people. Nuddea, to the north of Calcutta, and lying between latitudes 22° and 24°, is of a light but tolerably fertile soil, has excellent water-carriage, possesses a population of nearly 800,000, and besides its chief town of the same name, 60 miles north of Calcutta, and which was formerly the capital of a Hindoo principality, contains *Kishenagur*, *Santipoor*, *Chogdah*, *Plassey*, celebrated for the battle which decided the fate of Bengal, *Sibnibas*, and *Aghadeep*, which last place is famed for an image of Krishna, held in high esteem by the Hindoos. Midnapoor, the capital of which so called, lies 70 miles W. by S. from Calcutta, is of more than 7000 square miles extent, but scarcely presents any objects worthy of particular remark as to agriculture, produce, towns, or buildings. The people, too, are nearly as uninteresting, and seem to be in that state of ignorant content which promises no hasty revolution.

Burdwan, north of Midnapoor and Hooghly, though not near so large as the former, is in so much more prosperous a condition as to be esteemed the most productive territory in India of its size. It has no inland navigation, but enjoys some good roads, which have tended materially to the improvement of its commerce. Its population amounts to nearly a million and a half; and its chief towns are *Burdwan*, *Bissunpoor*, *Cutwa*, *Culna*, and *Okirah*. Birboom, in the north-west extremity of Bengal, is a small district, partly hilly, much covered with forest and jungle, sparingly inhabited, productive of rice and sugar, on the whole improving, remarkable for a number of iron forges, and having for its principal towns *Soory*, *Surrool*, *Nagore*, *Baidyanath*, and *Serampoor*. This last place must be distinguished from the Danish town of the same name, about 12 miles north of Calcutta, where the European missionaries, engaged in the conversion of the Hindoos to Christianity, have established a printing press for the purpose of multiplying copies of the Scriptures in the native languages.

Moorshedabad, a small district round the large city so called, which is a place of great trade, containing a population of about 160,000 souls, and situated nearly 160 miles north of Calcutta, is understood to be progressively advancing in culture and the manufacture of silk goods, but, from some causes not yet thoroughly understood, to have rather declined from its former healthy state. Among its towns are *Bogwangola*, a place of great trade; *Jungeypoor*, remarkable for its extensive silk establishments, which are the property of the East India Company; *Cossimbazar*, one of the largest inland trading towns in the province, only about a mile distant from Moorshedabad; and *Berhampoor*, where some European and native troops are commonly cantoned.

Chittagong, in the south-east extremity of the province, having Arracan on the south, the Birman dominions on the east, part of the bay of Bengal on the west, and the district of Tiperah on the north, is about 120 miles long by 25 broad. Much of it is hilly and unproductive, while other parts are of uncommon fertility. The maritime tract is much frequented by the Europeans of Bengal for the sake of its salubrious sea air and bathing. It contains above a million of inhabitants; and its capital, *Islamabad*, which has a good port, carries on a pretty extensive trade. The eastern boundary of this district is very hilly, much covered with jungle, and infested by robbers, most of whom are fugitives from the adjoining kingdom. The Kookies, a barbarous and bloodthirsty race of people, inhabit the mountains to the north-east of Chittagong, and occasion great uneasiness and mischief to the peaceable inhabitants of the neighbourhood. Tiperah, north of Chittagong, and forming the chief eastern district of the province, is also infested by the same troublesome beings. It is large, not well cultivated, but seems to be improving, and has an abundant population, though few large towns. *Comillah* is the capital.

Dacca Jelalpoor, north of Tiperah and Backergunge, at one time the largest district in Bengal, was reduced by the new arrangment of 1800, but is still very extensive. It is also very productive, especially in rice, to the cultivation of which, its liability to be inundated, however injurious in other respects, materially contributes. *Dacca*, its capital, has been elsewhere described. *Narraingunge*, eight miles south-east of it, has more than 15,000 inhabitants, who carry on a good trade in salt, lime, tobacco, and grain, the product *inter alia* of the district. Mymunsingh, north of the preceding district, has a fertile soil, watered abundantly by the Brahmapootra; is in an improving state; contains more than a million of inhabitants; and has *Bygonbarry* and *Serajegunge* for its chief towns. Silhet, at the eastern extremity of Bengal, and to the north of Tiperah and Mymunsingh, is bounded on the east by a country of which we have no certain information,—a fact not very creditable to the Bengal government. Silhet is nearly 3000 square miles in extent, with a population of about half a million; has a good deal of flat swampy land, which admits the growth of rice; yields also cotton, sugar, and large quantities of oranges and limes; and contains a town of the same name, between 200 and 300 miles north-east of Calcutta, and *Azmerigunge*, a trading place, 75 miles north-east of Dacca.

Rajshahy, the central district of Bengal, intersected by the Ganges and its branches, is often almost entirely covered with water. It is of great size, though lessened by the new arrangement; has about 1,500,000 inhabitants; and yields much silk. Its chief towns are *Nattore*, 43 miles north-east of Moorshedabad; *Bauleah*, 21 miles north-east of the same; *Hurrial*, a commercial mart, especially for silk; and *Comercolly*, where the company have a factory. To these may be added *Rajamahal*, chief town of the territory so called, though now reckoned to belong to Bahar.

Rungpoor, a district occupying the north-east extremity of Bengal, where it is bounded by Bootan, is very irregular as to shape, but may be reckoned 185 miles long by 116 broad, and to contain 7,400 square miles. Its soil is various, and on the whole inferior to that of most of the districts. Tobacco is its staple product, but it yields also wheat, the betel-leaf, indigo, some sugar and cotton. Its population is vast, exceeding two millions and a half; but the people are reckoned unhealthy, and an unusual proportion die in infancy. The number of Mahommedans exceeds that of Hindoos in the district; and the faith of the former is said to be gaining ground. The chief towns are *Rungpoor*, in lat. 25° 43′, long. 89° 22′, containing nearly 20,000 people; *Dhap*, where the public offices are held; *Jelpesh*, noted for a Hindoo temple to the god Siva; *Mangulhaut*, a well built trading place on the south side of the river Durlah; *Chilmarry*, on the Brahmapootra, 130 miles N. by W. from Dacca, celebrated for a Hindoo fesval, at which sometimes 100,000 are assembled; *Rangamatty*, 52 miles N. E. from Rungpoor, formerly of much note; and *Goalpara*, 170 miles N. by E. of Dacca, a place resorted to by traders with the Assamese, and where several native Portugueze reside.

Cooch Bahar, a district on the west and northwest of Rungpoor, much resembling the adjacent countries, is partly well cultivated, and partly in an unprofitable and wild condition. It is of about 1300 square miles extent. This district came, with the rest of Bengal, into the hands of the British in 1765, but did not engage much attention till 1772, when the raja sought assistance against the Bootanners, by whom he had been greatly distressed. The consequence of our interference was a peace with Bootan, from which much benefit was vainly expected. *Beyhar*, the chief place, is 32 miles north from Rungpoor.

Dinagepoor, north of Rajshahy and Mymunsingh, having Rungpoor to the east, and the district of Purneah and part of the province of Bahar to the west, is about 105 miles long from north to south, and 82 at its greatest breadth, containing more than 5000 square miles, by much the greater part of which consists either of a light-coloured clay or a free soil. It is watered by several rivers; has a vast number of marshy places; is not so flat as most of the provinces, though it has no elevations which merit the title of mountains; and has a population of nearly 3,000,000 souls, of whom a large proportion is Mahommedan. The bulk of this immense mass of human beings is far from enjoying an enviable state of existence. They are poor; their attempts at industry are feeble; and diseases are very prevalent among them, owing, it would appear, to scantiness of proper food, and want of comfortable dwellings. The district, moreover, is sadly infested with decoits, or gang-robbers, who find ample security for their predatory visitations in the nature of the country, and the imbecility both of mind and body on the part of the people. Rice, sugar, and tobacco, are the chief products. The capital, of the same name, lies 102 miles N.N.E. from Moorshedabad, contains 30,000 inhabitants, and displays a curious mixture of architecture in the construction of its buildings. *Malda*, on the Mahanda river, is famed for its mangoes, and has manufactures of silk and cotton. The ruins of *Gour*, the ancient capital of Bengal, are a few miles south of Malda.

Purneah, somewhat intermediate between the provinces of Bengal and Bahar, and lying to the north of Rajshahy and Boglipoor, the latter belonging to Bahar, is about 150 miles long by 90 broad, being upwards of 6000 square miles in extent, is on the whole a flat country, both susceptible of and that has received a good deal of cultivation, so as to be rendered one of the most productive districts in the province. Much of it is liable to inundation. Rice and other grains are grown abundantly on it; and it has several other products conducive to trade. The population has been estimated variously, from little more than one million to within a trifle of three millions,—the latter calculation being probably the more correct. Here the Hindoos are more numerous than the Mahommedans, which is generally the case throughout Bengal, though, as will have been observed, there are exceptions. *Purneah*, the capital, 125 miles N.W. by N. of Moorshedabad, is of very great extent, but does not contain above 40,000 people. It has lately become unhealthy, without any obvious cause. *Haldubarry*, 55 miles N.E. from it, has a fortress. *Nauthpoor*, on the Cosi river, by which much of Purneah is watered, is an improving town, chiefly through the exertions of Mr Smith, a merchant, who settled in it in 1810.

2. *Bahar*, the next province in this grand division that has to be described, lies between the 22d and 28th degrees of latitude, and the 83d and 88th longitude, having Nepaul on the north, Bengal on the east, Gundwana on the south and south-west, and Allahabad and Oude on the west. It is one of the finest, most fertile, and best cultivated provinces in Hindostan, possessing great natural advantages, as a good soil, a temperate climate, the benefit of being well watered by rivers, and a situation which permits extensive intercourse with other territories. These advantages were early perceived and cultivated, and accordingly it has long been noted for its progress in agriculture, the useful arts and commerce. Its chief productions are opium, cotton, the grains, indigo, sugar, nitre, oil, the betel leaf, wax, and a variety of vegetable essences. Besides the main body of the Ganges, which divides it into two portions, north and south, it has several rivers, as the Sone, the Gunduck, the Dummodah, the Caramnassa, the Dewah, and a great number of smaller streams. The inhabitants, comparatively speaking, are a robust and an active race, in a tolerably advanced stage of civilization, and in the enjoyment of much of the benefits of a British government. About a fourth part of them are Mahommedans. The districts into which Bahar is divided are,

Boglipoor, in the south-east corner, which is about 133 miles long, and 80 broad, containing upwards of 8000 square miles, and having a population of somewhat more than two millions of souls. It is greatly frequented by travellers, who pass through it to other districts; but its trade is not extensive in proportion. The chief towns in it are, *Boglipoor*, the capital, which lies 110 miles N. W. from Moorshedabad, in a pleasant situation, but is indifferently built, and has about 30,000 inhabitants, the majority of whom are Mahommedans; *Champanagur*, three miles west of it, mostly occupied by weavers, and noted for an image of a Mahommedan saint; *Curruckpoor*, in latitude 25° 8′, and longitude 86° 35′, the chief town of a zemindary so called; *Curruckdeah*, also the head of a zemindary, to the south-west of the preceding; and *Monghir*, a town and fortress, beautifully planted on a bend of the Ganges, in latitude 25°, 23′, longitude 86°, 26′, formerly of much note, and still of consequence from its extent, and trade, gardens, markets, and population, the last being reckoned at 30,000.

The district of Bahar, in the centre of the province, is, at the highest calculation, about 120 miles long by 80 wide, and about 5000 square miles in extent. Much of it is level, and well cultivated; but it has several hills that are scarcely capable of improvement, and in some places the soil is very poor. It is pervaded by the Ganges, which is no where fordable within the district. Rice is the chief crop. The people, who are estimated at 2,755,150, are in easy circumstances compared with those of many parts of India; but there are few very rich persons, or large land proprietors, among them. *Patna*, once the capital of the district, and still that of the province, and one of the largest cities in India, is in latitude 25° 37′, longitude 85° 15′, stands on the south side of the Ganges; is upwards of a mile and a half long, from east to west, and three-fourths of a mile broad, within the walls by which it is surrounded, but has extensive suburbs; has few good buildings, and these very close together; and is imagined to contain no less than 300,000 inhabitants. It enjoys a very large trade, and has a number of bankers, whose cash transactions extend over a great portion of India. *Bahar*, formerly the capital, is 35 miles south-east from Patna, a straggling town, consisting of about 5000 houses, and exhibiting the ruins of several mosques, which appear to have been creditable buildings. *Gaya*, the modern capital of this district, lies 55 miles south of Patna, is a town of very various character, as it is seen in various places,—part being well built, regular, and clean, and part the reverse, with intermediate differences. The old town is of high consequence in Brahminical superstition, though the devotees do not agree in their opinions as to its sanctity and pretensions. It is often excessively thronged by pilgrims, on whom the British government has thought proper to impose a tax, which is levied in the proportion of the ceremonies meant to be performed by different individuals. But this is a mere trifle in comparison of what is exacted by the officiating priests, who have long been notorious for fraudulent and unfeeling covetousness and gross dissoluteness of manners. *Dinapoor*, 10 miles west from Patna, has elegant and commodious barracks for European soldiers, who have good reasons for liking it as a military station. *Moneah*, 21 miles west from Patna, possesses cavalry barracks. *Daudnagur*, 30 miles south south-west of Patna, is a large place, with a cloth factory. *Tickary*, the residence of a wealthy zemindar, is a modern town, 50 miles south-west of Patna.

Tirhoot, a district which occupies the north-west corner of the province, has part of Nepaul on the north, the district of Purneah belonging to Bengal on the east, the Ganges on the south, and the district of Sarun on the west. It contains about 5000 square miles, with about two millions of people, of whom a fourth part are reckoned to be Mahommedans. It is a more elevated country than some of the southern districts, but cannot be called mountainous; possesses a healthy climate, is well watered, and has a good soil, by much the largest portion of which is pretty well cultivated. Its chief articles of production and export are tobacco, sugar, indigo, opium, ginger, and rice. There are forests towards the north. The British government selected part of this district for the purpose of rearing horses within their territories; and the success of the experiment has done justice to their choice and exertions. The fair of 1807 exhibited 6000 of these valuable animals, and the breed is understood to have improved rapidly. Hajypoor, the country where the stud was established, was at one time reckoned a separate district, but is now attached to Tirhoot. The town so called stands on the north-east side of the Ganges, at its junction with the Gunduck, and nearly opposite to Patna. None of the other towns in this district are particularly deserving of notice.

Sarun, which comprehends Bettiah or Chumparun, is to the west of Tirhoot. It is rather more than 5000 square miles in extent, and has the character of being one of the most flourishing districts under British government; but, as to productions, agrees generally with those which have now been described. The population is estimated at 1,200,000. The chief towns are, *Chuprah*, 32 miles west north-west from Patna, supposed to contain more than 40,000 inhabitants; *Manjee*, 44 miles north-west from Patna, near which is a banyan tree of from 363 to 375 feet diameter, and the circumference of the midday shadow of which is 1116 feet; *Sewan*, 66 miles north-west from Patna, which has a sort of Staffordshire-ware manufactory; *Manjduly*, *Carnoul*, *Maissy*, *Beltiah*, *Boggah*, and *Sugouly*.

Shahabad, a small district to the south of the Ganges, and having part of Allahabad on its western border, is very fertile, mostly under cultivation, and has a population of about two millions, of whom only a twentieth part are conceived to be Mahommedans. The character of this district is high for peaceable conduct, and freedom from gang-robbers. *Arrah*, the chief town, is extensive, and lies 35 miles west from Patna. *Buxar*, in lat. 25° 35' long. 83° 57', which has a dismantled fort, is noted for the victory gained over Dowlah and Ali Khan, by Sir Hector Munro, in October 1764. At *Sasseram*, 34 miles south of Buxar, there is a magnificent mausoleum, where Shere Khan, the Alfghan, was interred. *Rhotas*, in lat. 24° 38', long. 83° 50', has a fortress on the top of a mountain.

Ramghur, which forms the southern corner of Bahar, is in great part mountainous and waste, and its inhabitants, who are not numerous in proportion to its extent, are very defective in civilization and good morals. Thefts, robberies, and murders are frequent among them; and hitherto little success has attended the measures which have been devised for their improvement. Moreover, a considerable part of the district is very unhealthy, so that, on the whole, it is one of the least prosperous territories under the British. *Chittra*, the chief town, is 110 miles S. by W. of Calcutta. *Parsonauth*, among the hills between Bahar and Bengal, is one of the holy places of the Hindoos, and much frequented by pilgrims. *Palamow*, the head of a jungle zemindary, now attached to Ramghur, but, from its physical nature, and by the bad character and management of its old proprietors, of very little value, and which has caused a good deal of trouble to the British government, is only a village, 135 miles S. W. from Patna. *Pachete*, also the head of a zemindary, noted for its unhealthiness and unproductive condition, is 126 miles N. W. from Calcutta. Of another lately attached zemindary, called Chuta Nagpoor, very large, hilly, much covered with wood, and that is inhabited by a people who, from their being scarcely if at all converted to the Brahminical doctrines, are classed among the unclean and abominable by the priests of that faith, the principal town is *Burwa*, 240 miles W. N. W. of Calcutta. So imperfect and rare was the intercourse between this part of their dominions and the Bengal government, that the murder of the chief of Burwar, by orders of his immediate superior the rajah of Nagpoor, remained unknown from 1801 to 1807.

3. *Allahabad*, a province to the west of Bahar, having Oude and Agra on the north, Malwah on the

west, and Gundwana on the south, is about 270 miles long by 120 broad, and lies between the 23d and the 27th degrees of latitude, and the 78th and 85th longitude. The population is estimated at 7,000,000. Where it is watered by the Ganges and Jumna, which is towards the north, this province is flat and very productive; in the south-west quarter, where the rivers are small, the Kena and Goggra being the chief, the land is more elevated, and not so fertile. But in this latter part are found the diamond mines of Pannah. With the addition of the product of these mines, the articles of export are the same as in some of the provinces already described. Allahabad, as now divided, consists of eight districts, of which in order.

That of the same name with the province, adjoins the city so called. Its soil, where cultivated, yields wheat and other grains in considerable abundance, and these, with cotton cloths and chintzes, serve for a good export trade. The breed of sheep fed in Allahabad is remarkably small, and their fleece is too coarse for cloth. Altogether, this is a prosperous district. *Allahabad*, the capital, lies north-west of Calcutta 550 travelling miles. It is planted at the confluence of the Ganges and Jumna, where the former is about a mile broad. In consequence of this junction, it is reckoned one of the Prayagas, indeed the chief, and therefore called Prayaga by way of distinction, for which it is indebted to the supposed union of a third river, the Saraswati, though this, being not now visible, is imagined to join with the other two at a particular spot under ground. This belief is powerfully operative on the minds of the pilgrims, who expect the same benefit from religiously bathing at the place of union as from bathing in the three separately. On arriving here, it is customary for the devout individual to sit down by the water-side, and to have his head and body shaved in such a manner that every hair may fall into the river as it drops off,—a million of years abode in heaven being the blessing promised for each particle so disposed of. He then bathes. But some individuals, not content with simple immersion, actually drown themselves, by plunging into the threefold stream, after having performed certain ceremonies and attaching three pots of water to their bodies. This is not the only way in which lives are sacrificed to a monstrous absurdity, as the anxiety of the pilgrims to bathe at a particular spot, and at a particular period of the moon, when the expiatory service is thought most availing, occasions so great a concourse and struggling of the people, that some of them fall, and are actually trodden to death. The tax to government for permission to bathe here is reckoned moderate, three rupees *per head*; and the number of pilgrims, in 1812-13, was 218,792. The fort of Allahabad, a quarter of a mile from the town, is of very large dimensions, of respectable strength as a military position, and commands the navigation of the two rivers in its neighbourhood. *Currah*, 45 miles north-west from Allahabad, has several Hindoo temples and a ruined fort.

The district or zemindary of Benares, lying to the east of the preceding district, is for the greater part a flat well cultivated country, very productive in wheat, barley, and sugar, besides various culinary vegetables, which are chiefly grown by Europeans, and capable, too, of yielding rice, though this is only sparingly attempted. The winter is so severe here as to render fires necessary; whilst, on the other hand, the heats of summer are excessive. Muslin goods are wrought here for the purpose of trade; and indigo and opium are among its exports. The population is, perhaps, more than three millions,—the far larger portion being Hindoo. *Benares*, the capital, elsewhere spoken of, lies in lat. 25° 30′, long. 83° 1′. Its ancient name was Casi, the splendid; and its Sanscrit name is Varanaschi, derived from Vara and Naschi, two rivers. The country round it for ten miles is reckoned sacred by the Hindoos, most of whom have perfect confidence in the notion that even a short abode there secures an entrance to the heaven of Siva. So great is the opinion of this qualification, that it is thought to be almost of sufficient efficacy for those who are not of the faith; and many persons, it will readily be supposed, come here to spend the last of their days, in order that, by dying in so holy a place, they may make sure of a blessed futurity. The number of individuals who gain a livelihood by acting as guides to the pilgrims in Benares, or otherwise availing themselves of the prejudices in its favour, is very considerable, for it is quite usual for foreign Hindoo rajas to keep delegates in this city for the purpose of offering sacrifices in their behalf. But, besides its religious importance, it has long been in repute for its teachers of Hindoo and Mahommedan law; and Benares is now farther noted on account of its college for Hindoo literature, founded in 1801, during the residence of Jonathan Duncan, Esq. This has undergone several modifications since its establishment, so as to suit the habits and sentiments of the people, and thus extend the benefits which were originally meant by it. Still there is reason to doubt whether the plan that is acted on be the most eligible that could have been adopted with a view of promoting its object; and still more is it questionable whether the object itself, namely, the improvement of Hindoo literature and the excitement of a taste for it, be really conducive to the higher interests which ought ever to be kept in view in labouring for the civilization and welfare of this country. Benares has undoubtedly profited greatly by its connection with the British, and has accordingly been in a state of progressive improvement since 1781. The inhabitants, who, as appears by the last accounts, exceed 600,000, are better informed than the generality of the Hindostanese, and are often looked up to as such by their countrymen.

Ghazipoor, a zemindary of Benares, the capital of which, of the same name, lies 41 miles north-east from Benares, is celebrated for its rose-water, and is altogether a fruitful territory. The inhabitants of the town and its vicinity are equally well known for what is less to their advantage, a turbulent spirit, which needs the continual operation of a vigorous police to preserve them from dangerous violations of the peace.

Mirzapoor, a district of which the large trading town so called, situate about 30 miles travelling distance, W. S. W. from Benares, and noted for the business-like activity of its inhabitants, reckoned at 60,000, who have been greatly benefited by the example of the British merchants and indigo planters resident among them, is the capital, contains nearly a million of people, and has a number of smaller towns of from 5000 to 10,000 population. *Chunar*, 17 miles S. W. from Benares, was formerly of note, and had a fortress after the Hindostanee fashion, with walls and towers one behind the other, and which was thought to have considerable strength. *Bidjeaghar*, from 50 to 56 miles south of Benares, had also a fortress, which, having been taken by the British in 1781, during the revolt of Cheit Singh, has since been allowed to go to ruin.

Juanpoor, between the 25th and 26th degrees of latitude, to the north of the Ganges, is a tolerably cultivated and productive district, though its soil is chiefly of a sandy nature, and it is exposed to excessive heat during the summer. It has improved materially under British government; contains a large but not perfectly ascertained number of inhabitants, in the proportion of eight Hindoos to one Mahommedan; and has for its principal town *Juanpoor*, 40 miles N. W. from Benares, built on the banks of the Goomty, over which there is a very remarkable bridge, that was erected between two and three centuries ago, during the reign of Acber. The bulk of the inhabitants of this town are Mahommedans; but it is also the residence of the Hindoo caste of Rajcoomars, who were noted for the practice of infanticide, till the interference of the British government put a stop to the inhumanity. *Zafferabad*, 4 miles north of Juanpoor, contains 20,000 people. *Azimghur*, 37 miles N. E. from Juanpoor, manufactures cotton cloths, as it formerly did opium. The latter was prohibited as an invasion of the Company's monopoly. This place was ceded by the nabob of Oude in 1801. *Mow*, also ceded at the same time, and which was once a place of commercial importance, is 53 miles N. E. from Benares.

The district of Rewah, to which may be added that of Singhranah, between the 24th and 25th degrees of latitude, has a good soil and an industrious people to cultivate it, and is well watered. It was so much disturbed, in 1813, by a native banditti, who had even the audacity to attack the rear of a British force, which they cut off, that a detachment was sent out to extirpate them. The leader of the gang finding he could not escape, placed gunpowder on a cloth, in which he rolled himself, and setting it on fire terminated his days,—an event soon followed by the entire ruin of his miscreant associates, to the satisfaction of the rest of the community. *Rewah*, the capital, is 69 miles S. by W. from Allahabad, and has extensive suburbs, with a fort which serves as the raja's house. *Mow*, the residence of the chief of the Singhranee tribe, is 76 miles S. W. from Benares.

A large division of Allahabad is the district of Bundelcund, which lies between the 24th and 26th degrees of latitude, and between the Betwah and the Cane rivers. It is about 11,000 square miles in extent, high and mountainous, and not well cultivated. The number and nature of its hills render it a strong country in a military point of view, and its history indicates the consequent high opinion that had been entertained of its physical importance. But it is not populous. The language spoken here, called the Bundelcund dialect, is derived from the Sanscrit. This district is now under British authority; and its comparative quietness and freedom from gang-robbery and other public crimes, are creditable to the people, who are generally industrious, as well as to the system of police established among them. *Banda*, the present capital, though only a village a few years ago, is a prosperous and large town, 90 miles west of Allahabad. *Mahobah*, 28 miles S.W. from Banda, is greatly declined from its former consequence, as the ruins of several temples and other large buildings testify. ***Pannah***, the vicinity of which is celebrated for its diamond-mines, stands on an elevated, barren, rocky plain, in lat. 24° 45′, long. 80° 13′. It has some temples, an idol in one of which is said to have a diamond eye of great value. Little cultivation is to be seen even within three miles of Pannah; but the country round, to a considerable extent, particularly where the soil is of a gravelly nature, is alleged to produce diamonds. These are found most commonly mixed with pebble-stones, and are obtained by washing and separating, which last process is so carefully performed by the workman moving with his hand eight or ten pieces at a time, that the minutest portions of the gem are sure to come into notice. The workman may spend several days in this way without success; but a few diamonds in the course of a year recompence his labour. Most of them are under the value of 500 rupees; many are worth from 500 to 1000 rupees; few exceed in price the last sum; but the Pannah raja is said to possess one valued at 50,000 rupees. All the diamonds collected are brought into one house, where they are sorted, valued, and disposed of to the attendant merchants. The wages to the labourers, who are commonly poor, are the value of about three-fourths of those which are from the smallest size to that of a pea; two-thirds that of those the size of a hazel-nut; and one-half the price where the dimension is larger than a filbert,—an acquisition very rarely made. Sometimes 1000 men are employed in this work; and it is usual to have a watch over them to prevent smuggling, which would appear to be seldom attempted, probably from the certainty of being dreadfully punished if detected. The workmen believe that the production of diamonds is constantly going on in the earth of this place, and that there is as much chance of procuring them in those portions of it which have been turned up and examined, probably 14 or 16 years ago, as in what has never once been disturbed. This is a point which, though assuredly conceivable from the known composition of the diamond, it would be satisfactory to have decided on unexceptionable testimony. The profits of the diamond-mines are less than formerly,—a fact not a little at variance with the opinion now stated, and are altogether relinquished by the British government to the native chiefs. *Chatterpoor*, 135 miles W.S.W. from Allahabad, is a well-built town, but declined from its flourishing state as a commercial mart. *Callinjer*, upwards of 80 miles W. S. W. of Allahabad, and properly speaking, the head of a district of the same name, under its own raja, is noted for a fortress, built on a high rock of great extent, and the works of which are so large as to require 5000 troops to man it properly. It was besieged in form by the British in 1812, but unsuccessfully, and the assailants were repulsed with great loss. It capitulated a few days afterwards, the besieged being completely intimidated by the desperate nature of the attack which had been made on them. *Adjyghur*, another strongly fortified place, between Callinjer and Pannah, raised on a steep hill, and inaccessible, except by paths made up to the different gates, which are well defended, was besieged by the British in 1809. It also made an effectual resistance, but was afterwards evacuated. A circumstance attendant on this event manifests a savage resolution, quite characteristic of a superstitious people. The family of the zemindar who had stood out against cession to the British, being ordered to be taken from the place, an old man, his father-in-law, was sent into the apartment where the women were, to prepare them for removing. But as he did not return so soon as it was thought he might, the house was entered by the roof, when a shocking spectacle was beheld. He had cut the throats of all the women and children, eight in number, and then his own,—a deed in which it is highly probable he had been aided by some of the victims themselves, as no noise had been heard by those persons who were stationed at the door during its horrible execution. Close to *Myer*, a large but indifferently built town, 60 miles south by east from Callinjer, is a strong fort, in which resides the independent chief of the neighbouring country. *Jhansi*, a considerable place, 82 miles, N. N. W. from Chatterpoor, is the capital of a petty state, now under British protection, though feudatory at the same time to the peshwa of the Mahrattas. *Oochar*, formerly a city of some note, but now an insignificant town, is eight miles south from Jhansi. *Ditteah*, a town 43 miles S. S. E. from Gualior, and 20 east from Narwar, both in the province of Agra, of which hereafter, is the capital of a small principality, also under the protection of the British, with whom the rajah formed an alliance in 1804, when Bundelcund was ceded by the peshwa. The inhabitants of this territory are a good looking people, and make excellent soldiers. *Tethre*, also the capital of a chief under British protection, is 51 miles west from Chaterpoor; and *Bejawer*, in a like state, is 24 miles south by west from Chatterpoor. The fortress of *Maltown*, on the south-west boundary of the province, commands the pass into it in that direction. *Gurrakota*, 90 miles S. S. W. from Chatterpoor, is the capital of a petty state, the raja of which was obliged to submit to the British in 1818.

The district of Caunpoor, which lies to the north of the river Jumna, and between the 26th and 27th degrees of latitude, is a territory ceded to the British by the nabob of Oude, whose dominions are immediately to the east. It is a fine arable country, and produces Indian corn, wheat, and barley in abundance, besides various European fruits and vegetables which have been introduced by its new masters, and which are also favourites with some of the natives. But there are still extensive wastes in it, which might, by proper care, become as valuable as the rest. Its population is undoubtedly great, as the quantity of land under tillage implies, but the amount is not yet known. *Caunpoor*, the capital, a town on the west side of the Ganges, 45 miles from Lucknow, is a place of great commercial importance. Here, too, there are barracks, in which a portion of the Bengal army is usually stationed. The accommodations for them are good, but the troops suffer much in the dry season from the dust, which frequently rises in such thick columns as to occasion a very perceptible darkness. Wolves are very prevalent in this country, and are sometimes so daring as to rush among the huts of the natives, and carry off children who may happen to have strayed from their keepers.

Manicpoor, which has a capital of the same name, situate about 80 miles S. S. E. from Lucknow, is a flat, sandy, but pretty fertile territory, still belonging to the nabob of Oude. Its state of cultivation is decidedly inferior to that of the districts on which the British government has shed its genial influence. *Dalmow*, a town in this district, on the banks of the Ganges, 54 miles south from Lucknow, has several handsome pagodas and a fort.

4. *Oude*.—This province lies between the 26th and 28th degrees of latitude. It is separated on the north from several small tributary states of Nepaul by a range of hills and forests; has Bahar on the east and Allahabad on the south, and the west is bounded by the provinces of Delhi and Agra. It is one of the smallest provinces in this division of Hindostan, being only about 250 miles long and 100 broad. It is level, well watered, and, where it is cultivated, very productive in various grains, sugar, maize, and opium. Nitre is also spontaneously generated in it, in large quantities. The people are a fine race of beings, superior in many respects to those of Bengal and some of the northern districts. This remark applies particularly to the Rajpoots, who are a tall robust set of men, and admirably fitted for the military life. From this country the Company are said to derive many of their best native troops. But besides their natural qualifications for the profession of a soldier, the inhabitants of Oude were for a long time under the necessity of exercising themselves in the means of defence, in consequence of the state of anarchy in which their country was involved,—and thus certain habits have been induced among them which contribute essentially to the same kind of excellence. The province was formerly greatly exposed to inroads from the Mahommedans; and such has been their influence in it, that a large portion of the people profess the religion of the Koran. It was attached to the sovereign of Delhi from an early period till the dissolution of the empire at the death of Aurengzebe. The present ruler is descended from Saadet Khan, who was a native of Bishapoor, in the province of Khorasan, and who became soubahder of Oude in the reign of Mahommed Shah. To him succeeded his nephew, who died in 1756, and left his throne to his son Shujah ud Dowlah, who reigned till 1775. Asoph ud Dowlah, his son, succeeded him, and reigned till 1797. On his death, his spu-

rious son, named vizier Ali, ascended the throne; but filled it for a short time only, as, on his illegitimacy being discovered, he was dethroned by lord Teignmouth, when the government was entrusted to the brother of the late nabob, who was proclaimed sovereign of Oude in 1798.

Some years previous to that event, the dominions of Oude extended over all the flat country on both sides of the Ganges, between that river and the northern mountains, excepting Rampoor, and also over a great part of the tract between the Ganges and the Jumna, to within 40 miles of Delhi. This extension was greatly owing to its friendly relation to the British, by whom also its peace had been materially preserved, the Company providing a force for its service, the expense of which naturally devolved on the nabob. In course of time there arose occasions which required additional means of security in behalf of Oude; whilst, through mismanagement of its funds, the pecuniary obligations of the nabobs were not regularly fulfilled. Moreover, it was long evident to the British that these princes were unworthy of their dignities, and ruled in a manner which could not prove beneficial to their subjects; but circumstances had induced the Company rather to wink at the various instances of incapacity and imprudence which occurred in Oude, than to attempt an interference, which would be certainly construed unfavourably. A fit opportunity at last presented itself, and was not lost by the Bengal presidency, which succeeded, by the treaty of 1801, in obtaining a cession to the British of a large portion of the nabob's territories, as an equivalent for the former subsidy. It was now agreed that the nabob's remaining territories should be protected from all foreign and domestic enemies, free of any other expense to him; and, in consequence, he dismissed the greater part of his troops. Farther stipulations were also made with a view to the better administration of his affairs, in which he pledged himself to take counsel of the British. The arrangement of these and sundry other points was completed on the 22d February 1802, on which occasion the nabob declared his intention to promote his second son to the situation of minister for the affairs of his government, an appointment in which the marquis Wellesley concurred. Since this period the condition of Oude has been that of comparative tranquillity. But the nabob himself, Saadet Ali, who was a man of considerable talents for business, and paid a marked attention to the concerns of his country, neither proved so faithful as might have been wished to his treaty with the British, nor availed himself of their friendly advice, so much as would have been to his own advantage and the advantage of his subjects. Thus, when sundry dissensions arose among the members of his family about the distribution of the effects of the celebrated eunuch Almas Ali Khan, and other matters, so as to endanger the peace of his dominions, he showed a strong disinclination to employ his British auxiliaries; and various suggestions and remonstrances on the subject of his administration, which was singularly defective and disadvantageous, were quite ineffectual to produce a change. The Bengal government at length ceased to interfere with him, even in the way of advice; but, immediately on his death, which took place suddenly on the 11th July 1814, contrived to stipulate with his successor for the due observance of subsisting treaties, and farther obtained his agreement to several additional proposals, of a salutary nature, which had been formerly urged in vain. As a proof of the attachment of the new nabob to his allies, who were then engaged in the arduous war with Nepaul, he offered them, during a conference with the governor-general at Caunpoor, the loan of 10 millions of rupees, which was cheerfully accepted. At another interview he solicited the acceptance of that sum as a gift. But this was declined, except as a subscription to a loan then open, and for which he should receive interest. Other pecuniary arrangements of the most amicable kind took place shortly after, especially a farther loan to the same amount, which was found desirable to the British in consequence of the prolongation of the Nepaul war; and, accordingly, at one time, the nabob was actually a creditor of the British government to the amount of more than two millions sterling, for which he received interest. He is supposed still to remain a creditor, though only as to the half of that sum.

The territories now possessed by the nabob occupy about 21,000 British square miles, and contain about three millions of inhabitants. His revenue is great; and might be vastly more, were a proper mode of government adopted by him. But, on the other hand, his expenses are chiefly personal, and to no large amount, so that it is thought he can easily lay up, if he chuse, no less than half a million sterling annually. He is therefore a person of high consequence, as it is evident that his wealth would enable him to take an important part in the politics of Hindostan. But he is now so completely dependent on the British, that he is no longer to be regarded as a free monarch; and such is the nature of the connection between him and them, that nothing short of the most consummate ingenuity and deceit, to which there is no reason for fearing he will have recourse, could enable him to take any measure that might be seriously injurious to the Company's interests.

Lucknow, the present capital of Oude, stands on the south side of the Goomty river, at 650 miles travelling distance from Calcutta, 280 from Delhi, 202 from Agra, and 189 from Benares. After the removal of the seat of government to it from Fyzabad, in 1775, Lucknow became one of the largest and richest towns in Hindostan. Its population was estimated, in 1800, at 300,000; and it became the residence of the bankers and men of property. It is probable that it has suffered not a little in consequence of the declension of the Nabob's power and splendour. Much of the town has a mean appearance; but several of the public buildings are large and elegant, as the palaces of the nabob, especially the Imaum Barry, built by Asoph ud Dowlah, the great mosques, and burying places. Here, in a religious sepulchre, lies the body of the late nabob Asoph ud Dowlah,—the grave is covered with rich barley bread brought from Mecca, flowers, and gilt paper; at one side of it is a censer with per-fumes; on the other the nabob's sword and waistband, and opposite his head lies his turban with a copy of the Koran. The sepulchre is lighted with lamps; and prayers from the Koran are chaunted in it day and night. Near Lucknow is Constantia, the residence of the late general Martin, who is said to have expended on it about L.150,000 Sterling.

Oude, 79 miles east from Lucknow, on the south side of the Goggra river, was once reckoned among the largest cities in Hindostan, but is now almost entirely in a state of decay, though tolerably populous. It is one of the sacred places of the Hindoos, has several temples, and is visited by pilgrims, who perform in it a number of holy ceremonies. *Fyzabad*, formerly the capital of the province, is close to the town of Oude, of large size, and has a numerous population. It was the residence of the Bhow Begum, mother of Asoph ud Dowlah, whose immense wealth was, at her own particular instance, to be bequeathed to the British government, which, most honourably, refused to accept of it, and recommended the division of it among her relations. It was accordingly entrusted to the government for such purpose, to the amount of L.678,606 Sterling, after clearing the expenses of her funeral, a mausoleum, and other matters.

A district of Oude, called Baraitche, on the north side of the Goggra, and near the dominions of Nepaul, is partly hilly and woody, and partly open and well cultivated. One section of it was ceded to the British in 1800. All the remainder belongs to the nabob. The town of the same name, pleasantly situated on the river Sy, is 64 miles north-east from Lucknow.

Khyrabad, another district in the northern portion of the province, is fertile and well watered, though not extensively or judiciously cultivated. Its capital, so called, is 45 miles north by west from Lucknow.

The district of Gorucpoor, bounded on the north by part of Nepaul, on the east by the Gunduck, on the south by the Dewah or Goggra, and on the west by part of the nabob's dominions, is one of the cessions to the British government. It is not reckoned very healthy, and is understood to have been once more prosperous than at the time of its surrender, which will probably result in its reimprovement, though the measures hitherto adopted with this intent have not proved very successful. Its situation, in the immediate neighbourhood of two independent states, those of Nepaul and Oude, will demand no small attention on the part of the government, and is probably the cause why it is found somewhat difficult of administration, and has been frequently beset with depredators, who have no permanent habitations. The town so called is 145 miles north-west from Patna.

Buttool, a small district belonging to the British, though the village whence it has its name is Nepaulese property, is chiefly noticeable for its situation and competent subserviency to merchants between some of the southern districts of Hindostan and the independent countries in the north.

5. *Agra*, bounded on the north by Delhi, Ajmeer on the west, by Malwah on the south, and Oude and Allahabad on the east, is about 250 miles long by 180 broad. Its chief rivers are the Ganges, Jumna, and Chumbul; but it is not superabundantly watered. It is flat and open to the north-east of the Jumna, but more hilly and covered with trees to the south of the Chumbul. In point of climate it is on the whole temperate, though not very salubrious. The heat of summer is intense, especially when the hot winds prevail; and, on the other hand, the winter is rather cold. The agriculture of this province is very indifferently attended to; and consequently it is not so productive as it might be. Indigo, sugar, and cotton, are its chief growth. Those districts which are under British government are decidedly in the most prosperous state. The breed of horses in Agra is superior to that of the more eastern and southern provinces. A manufacture of coarse cloth, to an inconsiderable extent, furnishes almost its only export commodities in addition to its raw materials. This province is not very populous. The rajas of Macherry and Bhurtpoor, and other chiefs in alliance with the British, possess the north-western and western districts of Agra; the country to the east of the Jumna, and a portion round the city of Agra, belong to the British; and the remaining territories to the south of the Chumbul pertain, with the single exception of the district of Kalpee, to the Mahrattas. In ancient times this province was of more consequence than it has ever been since the Mahommedan invasion, on which event it shared in the fate of Delhi, and in the reign of Acber was one of the chief provinces of the Mogul empire. On the death of Aurengzebe it became exposed to the attacks and ravages of several tribes, particularly the Mahrattas, who seem to have aimed at the re-establishment of regal authority in it; though one of their chiefs, who was successful in his invasion, ruled in it for some time quite independently of Delhi.

Agra, the capital both of the province and a district of the same name, is a large city on the south-west side of the Jumna, about 137 miles from Delhi, and upwards of 800 from Calcutta. It was once among the most prosperous cities in Hindostan, and held a sacred character in Hindoo mythology, as the supposed spot of the Avatar, or incarnation of Vishnu, and was the capital of the emperor Acber. But it has greatly dwindled in modern times, and is apparently fast sinking into insignificance. The British captured it from the Mahrattas in 1803, since which period it has remained in their hands, and it has been made the seat of a civil establishment. This, with its convenience for trade with the west of Hindostan, may probably contribute to its restoration, or, at least, in some measure, retard its farther decline; in proof of which it may be mentioned that, in 1818, the customs of Agra exceeded considerably those of the preceding year, and are understood to be still on the increase. The mausoleum of Acber is about six miles north from Agra. The population of this city is probably less than 60,000. A strong garrison is usually kept in its extensive fort, which has been much improved by the British since its surrender. Among the artillery which fell into their hands on the capture of Agra, was a piece commonly called the great gun of Agra, and of which the following are given as the extraordinary dimensions: calibre 23 inches, metal at the muzzle $11\frac{1}{2}$ inches; its length 14 feet 2 inches; length of the bore 8 feet 8 inches; length of the chamber 4 feet 4 inches; diameter of chamber 10 inches; the weight of the whole 96,000 pounds; and that of a ball of cast-iron intended for it, 1500 pounds. No account has been received as to its fabricator. In an attempt to float it down to Calcutta, for the purpose of being sent to England, it broke through the raft on which it was conveyed and sank into the sand of the river.

Futtipoor, 19 miles W. S. W. of Agra, is inclosed by an extensive wall, but is very sparingly inhabited.

Mathura, 30 miles N. N W. of Agra, is noted in Hindoo mythology as the birth-place of the deity Krishna. On this account the Mahommedans, early in their invasion, attacked, took, and destroyed it. Afterwards it was rebuilt and ornamented with temples, especially one which cost 36 lacks of rupees. This was demolished by Aurengzebe, under whom it was succeeded by a mosque built out of the same materials. The town remained attached to the Mogul government till its overthrow, after which it suffered great misfortunes, and, in particular, a massacre of the inhabitants by Ahmed Shah Abdalli. It came at length into the power of the Mahrattas, who gave it to their commander-in-chief, general Perron, by whom it was rendered stronger, and made the establishment of a foundery for cannon. Lastly, it was taken in 1803 by the British, with whom it has since remained, and to whom it serves as the head-quarters of a military force. Both this place and *Bindrabund*, which is a large town on the Jumna, about five miles farther N. N. W. are still resorted to by Hindoo devotees, as the scenes in which Krishna spent his youthful days. At the latter place there are several pools where the pilgrims perform expiatory oblations; and near it is a mountain which is said to have received its particular shape from its yielding to the great weight of Krishna, as he sat upon its top during the adoration and offerings of the people, whom, in a time of drought, he had recommended to propitiate the presiding deity. Mathura is noted for a peculiar breed of monkeys held sacred by the Hindoos, and for the support of which a special fund has been alloted. One of these, which happened to be wounded at the battle of Panniput, became lame, and in consequence of this circumstance resembled his patron, so that he was treated with more than ordinary respect. As a farther evidence of the esteem in which these monkeys are held, it may be mentioned, that two British officers having inadvertently fired at them, were attacked by the priests and devotees in such a manner as to be forced to make an attempt at crossing the river on their elephant, in which they lost their lives.

The term Doab, signifying a tract of land lying between two rivers, is applied to several districts in Hindostan. One of these, the southern portion of which is in Agra, is contained between the Ganges and the Jumna. It is fertile, at least where it is well cultivated, and in some places produces the indigo in a wild state. It seems, from the very numerous ruins found in it, and other circumstances, to have been once much more populous and flourishing than it is at present; and hopes are entertained, that its cession to the British by the nabob of Oude, to whom it lately belonged, will, ere long, prove instrumental to its recovery. The people are generally disposed to industrious habits and a proper degree of subordination to established laws; so that, in addition to the convenience of the country for commercial intercourse with other districts, it is reasonable to think that these hopes will be realized. The Doab was not an original possession of the nabob of Oude, but was derived to him through the agency of his British allies.

Etaweh district, forming part of the Doab, was ceded to the British in 1801 by the nabob. Its civil establishment is subordinate to the Bareily court of circuit. For some time there were parts of this territory which refused allegiance to the British; and a few years ago it was much disturbed by predatory parties, whom it required the intervention of a military force to quell. The recent accounts of it give a more favourable view of its submissiveness and tranquillity; though there is reason to believe that great attention will still be requisite to guard against the inroads of gangs from the adjoining countries. *Etaweh*, formerly the capital, is 70 miles S.E. from Agra. *Kanoge*, now the capital of the district, as in earlier times it was that of an empire, has dwindled into an insignificant place, consisting of no more than one street. But the ruins of the vicinity imply its former grandeur and extent. It is on the Ganges, about 75 miles to the west of Lucknow.

Sindhouse is a pergunnah in this district, to the south of the Jumnah, inhabited by a race of people who have been found excessively troublesome from their insubordinate and disorderly conduct.

The district of Furruckabad, also within the Doab, has Bareily and Alighur on the north, Etaweh and Caunpoor on the south, Bareily on the east, and Alighur on the west. In character it corresponds with the rest of the Doab. It formerly constituted a sort of principality under its own chief or nabob, who was tributary to the nabob of Oude. While in this state it was wretchedly governed, and constantly exposed to the most dangerous dissentions and public crimes. An arrangement with the nabob of Oude in 1801, transferred its tributary dependence to the Company, who made an agreement for a certain allowance to its own sovereign. The consequences of this measure have been most beneficial to the people. The capital, so called, is at a little distance from the west bank of the Ganges, and upwards of 100 miles from Lucknow. It is a large, tolerably well built town, containing about 70,000 inhabitants. *Futtehghur* is so near to it as to form a part of Furruckabad. *Kalpee*, once the capital of a state, is a trading town on the south-west bank of the Jumna, about 28 miles from Lucknow. It now belongs to the British, having been ceded to them in 1806 by Nana Govand Row, to whom some villages were given in exchange. In the vicinity of this place was fought, in 1765, the first battle between our countrymen and the Mahrattas, who had come to the aid of Shujah ud Dowlah, and who were so completely routed as to be forced to cross the Jumna in disorder.

Jalooan, 30 miles west from Kalpee, is a large populous town, under British government, and enjoys a tolerable trade, especially in cotton.

Narwar, a district of Agra, in the south quarter, is hilly and woody, but in many places has a good soil, which amply repays the labour of cultivation. The Sinde is its principal river. Its chief towns are, *Narwar*, on the south-east side of that river, an ancient place, conquered by the Mahommedans, and afterwards re-established under the government of Hindoos; *Collarass*, an inconsiderable place, surrounded by an old wall; and *Shepoor*, almost entirely a ruin.

Gualior, the capital of the dominions of Sindia, lies 70 miles south of Agra. It is a strong fortress, built on a hill, which is so steep that it was thought secure against assault, till 1780, when it was effectually stormed by Major Popham. The town, which is on the east side of the hill, is large and well inhabited. The position of Gualior and its natural strength must always have rendered it a place of consequence, and such it has always been esteemed, though the idea of its impregnability has been repeatedly belied by its history. In the time of the Mogul empire, it was employed as a state prison, and was converted to the same use when in the hands of Madhajee Sindia, who obtained possession of it in 1784 by bribing the garrison. In 1804 it was invested by the British, and ultimately surrendered to them. But in the following year, on their relinquishing all their territories south of the Chumbul, it was given up to Dowlet Row Sindia, in whose time a new city has grown up, at a short distance to the south-west.

Gohud is the capital of a district in this province, which is either possessed by, or tributary to Dowlet Row Sindia, though conferred by the British on the Rana Kirrut Singh Luckindra, but without his having the means, or being promised the aid of the donors, to secure him in it. The town is 22 miles north-east from Gualior.

Mundlayer, 75 miles south-west from Agra, was once of importance, and the capital of a district.

Dholpoor, 34 miles south by east of Agra, is a town of considerable size, near a fort of the same name, on the banks of the Chumbul. It is the capital of a pergunnah under a rana; to whom belongs also *Barree*, 42 miles south-south-west of Agra, a place much inhabited by Patans, and where there are several Mahommedan tombs.

Karouly, 75 miles south-west of Agra, has a fort in the centre, and is the chief town in the dominions of the raja of Karouly, who is of the Rajpoot tribe of Jadoo, and whose territories have been greatly harrassed by the Mahrattas.

Bhurtpoor is an independent state, forming the western boundary of Agra, under a raja of the Jaut tribe, who have only lately acquired any distinction in Hindostan; but whose history is rather painfully interesting to British feelings. Their origin is neither high nor creditable, as they are derived from the Sudras, and for some time exercised the dishonourable profession of public plunderers. Yet they assumed consequence, and occasioned no small trouble to the British as well as their neighbours. A treaty of friendly alliance was concluded between them and the Company in 1803; but notwithstanding this, they soon afterwards aided Row Holcar, with whom the latter had had some essential differences, and who had recently been defeated by lord Lake. The town of Bhurtpoor, which is strongly fortified, was opened to the discomfited army of that troublesome chief; and, in farther testimony of disaffection, it was found that a broad ditch which surrounds the place had been filled with water, so as to present a formidable obstacle to the pursuers. Other measures had also been taken decidedly in expectation of a siege. Lord Lake arrived before the fort on the 3d of January 1805; but his army was found to be too small to undertake its complete investment, in consequence of which the operations of the siege were much impeded. Four successive storms occasioned a loss to the British of more than 3000 men, while that of the garrison was comparatively very insignificant. But not so the injury done to Holcar, whose forces, which had been encamped under the walls, were totally routed, and whose artillery was all taken. The raja perceiving the determined spirit of the British, and apprehending the ultimate success of their extraordinary endeavours, thought it most prudent to offer to surrender the fort, and force Holcar to quit it. Another treaty which followed contained some new stipulations, of a nature calculated to afford greater security to the British, and appeared for a time to be faithfully maintained by the raja. But though it was essentially to his advantage to preserve a good understanding with them, his conduct in 1814, when he refused to suffer an envoy to reside at his court, proved very suspicious; and the opinion generally, and in all probability correctly, entertained of him is, that he is by no means cordially attached to his nominal allies, and that he would be ready to avail himself of any favourable opportunity to testify his real hostility of feeling.

Deeg, a town and fortress belonging to the raja of Bhurtpoor, is about 57 miles north-west of Agra. It was at one time kept by the British as a hostage for the raja's fidelity to his engagements, but is at present in his own hands. Under the walls of this place, lord Lake decidedly defeated Holcar in 1805.

At *Laswaree*, a village 73 miles north-west from Agra, the same able general obtained a victory over Dowlet Row Sindia on the 1st November 1803, after a desperate battle.

Biana, 50 miles W. S. W. of Agra, was once the capital of the province, and is still a considerable place. It belongs to the raja of Bhurtpoor.

Weyre, also belonging to the same raja, is a large town with a mud wall and a citadel, 50 miles to the west of Biana.

The district of Alvar, Macherry, or, as it has sometimes been called, Mewat, lies to the west of Agra, in the centre of Hindostan. It is hilly, but quite susceptible of cultivation, which has been most sparingly extended to it by the semi-savage and predatory inhabitants. It has often changed masters, though its peculiar nature, and its abounding in places well fitted for defence, would seem to promise it exemption from conquest. A friendly treaty was entered into with its raja in 1803 by the British, to whom he behaved honourably in the eventful crisis of the following year, and who did not fail to reward him accordingly. But his influence was not sufficient to prevent the incursions of many of the Mewatees into the territories of his allies, who, perceiving the impossibility of restraining them by forcible means, had recourse to a system of conciliation, which has been found so much more efficacious that comparatively few causes of complaint have since occurred. Fierce, and accustomed to lawless occupations as they are, these people are observed to be sensible of kindness, and have frequently manifested a degree of fidelity, when trusted, which could not be imagined to exist in their character. A state of mental derangement on the part of the raja of Macherry, which took place in 1811, and was succeeded by a kind of religious intolerance towards his Mahommedan subjects, and by several other peculiarities which could hardly be deemed consistent with common sense, gave no small trouble to the British, who were under the necessity of interfering with his affairs, so as to preserve the benefits and fulfil the obligations of their treaty with him. The place which gives a name to Macherry, 60 miles north-east of Jeypoor, is not now the most considerable town in the district, but yields to *Alvar*, which is situate at the foot of a hill, is strongly fortified, is the residence of the raja, and stands in lat. 27° 44, long. 76° 32.

Firozepoor, the capital of a country in connection with the Mewaty pergunnahs, belonging to Ahmed Bush Khan, is 55 miles S. S. W. from Delhi.

Narnoul, 86 miles south-west from Delhi, is a very ancient place, and the frontier town of the raja of Jeypoor.

Sengauna, 100 miles south-west, and *Canoor*, 80 miles west south-west from Delhi, are towns of some consequence in this part of Agra.

The large district of Alighur, in the Doab of the Ganges and Jumna, is very fertile where it is cultivated, and is inhabited by a race of people less remarkable for subordination of spirit than excellent physical qualities. The town of this name is 53 miles north of Agra, and was captured by the British in 1803, after a very formidable and destructive resistance on the part of the fortress, which is reckoned one of the strongest in Hindostan. It was at that time the principal depot for the military stores of Dowlet Row Sindia, who had the mortification of losing them all, to the amount of 281 pieces of artillery, with ammunition, small-arms, and various other articles of high value in his account.

Bijeyghur, a fortified place 20 miles S. S. E. of Alighur, was also captured by the British in 1803.

Hatras, 31 miles north of Agra, and *Moorsaun*, only 29, were long considered strongly fortified, but have lost that character from the chastisement inflicted on them by a British army in 1817, when it became absolutely necessary to resent the pertinaceous and highly unfriendly behaviour of their chiefs, Dyaram and Bhugwunt Singh. This duty was entrusted to major-general Marshall, whose judicious operations and powerful agents soon brought them to sobriety.

Cumoonah, a mud fort in the district of Alighur, was, in 1801, besieged by the British, who had cause of offence against its zemindary. The assailants were repulsed with a loss, which those, who are ignorant of the nature of such a species of defence, would be surprised to hear exceeded what is sustained in many pitched battles. The besieged thought proper to evacuate the place during the night.

6. *Delhi*, lying between the 28th and 31st degrees of latitude, having Agra and Ajmeer on the south, Oude and part of Northern Hindostan on the east, Lahore and part of the same on the north, and Ajmeer and Lahore on the west, is about 240 miles long by 180 broad. Great part of it is extremely parched and consequently sterile, as in the western quarter, and between the Jumna and Ganges, where a few oases, at considerable distances, are all that relieve the nakedness of the land. The territory between the Jumna and Sutuleje, though little cultivated, by reason of the long continued state of discord and hostility to which the country has been exposed, yields grain freely. But even here the want of rain is so much felt, that irrigation is one of the essential processes in agriculture, and the inhabitants are obliged to dig wells to a great depth, in order to procure one of the most important necessaries of life. Where this province is liberally supplied with water, as in the districts near the Gaggur, Sereswati, and other streams, it is equal in fertility to almost any part of Hindostan. The population has been recently estimated at about eight millions, consisting of Hindoos, Mahommedans, and Seiks. Those parts of the province which are under British government are understood to be advancing to prosperity, and are certainly in a much happier and more promising condition than those which remain in the hands of the native chiefs.

Delhi, now the capital of the province, as it was of the Patan and Mogul empires, is upwards of 900 miles north-west from Calcutta. It is supposed that, in its state of highest splendour, it covered a space of 20 square miles, and the ruins which are still discoverable seem to confirm the opinion; but the modern town, though large, is of very inferior magnitude, and has few pretensions to elegance. The palace is planted on the west bank of the Jumna, has a stone wall on three sides, and is nearly a mile in circumference. Among other public buildings is a number of mosques, only a few of which are large. The remains of palaces and extensive gardens, indicate both the taste and the affluence of former times. Most of the houses are built of brick, the bazars are rather poorly furnished, and, with the exception of two, the streets are narrow. The population is between 150,000 and 200,000, a number not proportioned to its vast size. In point of commerce, Delhi is of little note. Cotton cloths and indigo are manufactured in and near it. A canal which runs about 100 miles to this place, and which was long allowed to be choked up, has been recently cleared out by the orders and at the expense of the British government. The chief events in the history of Delhi, and which bear relation to that of Hindostan, may be thus enumerated.

It was held by rajas in A. D. 1008; and, after being taken and plundered by the Mahommedans in 1011, was restored to its native chief. In 1193 it fell into the hands of Cuttub ud Deen, who established the Afghan dynasty; and in the reign of one of this race, in 1398, Timour obtained possession of Delhi, which he pillaged. About the middle of the 15th century, its supremacy was not much better than nominal over the neighbouring chiefs; but it was fully restored and augmented by Baber, who in 1525 defeated its prince Ibrahim Lodi, and established the Mogul empire, which arrived at great splendour and power in the reign of Jellalud Deen Mahommed Acber, whose death took place at Agra in 1605. Aurengzebe, the greatest of his successors, died in 1707, after which this empire rapidly declined. In 1735 the Mahrattas approached to Delhi, and set fire to its suburbs; and in 1739 it was entered and plundered by Nadir Shah. Ahmed Shah, successor of Mahommed Shah the third, was dethroned and blinded in 1753. Shah Allum, who ascended the throne of Delhi in 1761, provoked the resentment of the British, to whom he was at length forced to surrender himself unconditionally, and from whom, on his giving up the dewanny, he received a pension and a territory, both of which he forfeited in 1771, by repairing to Delhi, where he became completely subservient to the policy of the Mahrattas, then masters of the city. He was at last murdered by Gholaum Kaudir the Rohillah, who effected a sudden attack on Delhi in 1788, and made him prisoner. It was at that time in the hands of the Sindia family, with whom it remained from 1770 to 1803, when, after the defeat of Dowlet Row Sindia by lord Lake, it was entered in triumph by the British, who have ever since continued its masters, though nominally under the Mogul emperor. The unfortunate and aged Shah Allum himself, who was alive at the time of this extraordinary revolution, heartily rejoiced at its occurrence, and readily acquiesced in the proposals which were made for his future comfort. He died in 1806, and was succeeded by his son Acber the second, whose foolish conduct and absurd determination to prefer to the throne the fourth of his sons, required the intervention of British agency. It is indubitable that the interests of Delhi have been rapidly improving since it experienced the influence of European direction. The king, who is a weak and vain-glorious man, seems anxious to have the splendour of his family restored, and has made repeated attempts to revive at least the pageantry of his office. But, as the British, so far from being indebted to him, have been his protectors and benefactors, they are under no obligation to promote any of his views which in the least contravene their own rights and welfare. He appears, therefore, to have no chance of realizing his splendid wishes.

Rewary, a town 50 miles S.W. from Delhi, has some commerce. This was one of the places given to the raja of Bhurtpoor, but taken from him again in punishment of his infidelity.

Shamlee, 53 miles north of Delhi, is a considerable and rather a neat looking town.

Paniput, 50 miles N. by W. from the capital, was formerly of great commercial note, and is still a large place. It is still more famous as the scene of two of the greatest and most decisive battles ever fought in Hindostan; namely, that of 1525, which ended the Patan dynasty, in the defeat and death of Ibrahim Lodi, when the Mogul empire commenced; and that of 1761, between the Mahommedans, under Shah Abdalli, sovereign of Cabul, and the Mahrattas under the Bhow Sidasiva, in which the latter, who, reckoning men, women, and children, as constituting their camp, are supposed to have amounted in all to nearly 500,000 souls, were so dreadfully defeated as to be almost entirely either killed or taken prisoners.

The territory of Rohilcund lies to the east of the Ganges, between the 28th and 29th degrees of latitude, and the 78th and 80th longitude, and to the north of the dominions of Oude. Its chief rivers are the Ganges, Ramgung, and Goggra; but there are many smaller ones, so that the country is on the whole well watered. It is flat throughout, and abundantly fertile wherever labour has been bestowed on the cultivation of the soil. Its chief products are, grain, sugar, indigo, cotton, and tobacco. The people, who are originally an Afghan or a Patan race, and are generally Mahommedans, have the character of being courageous and hardy, but at the same time savage in their manners, deceitful and sanguinary, and very ill disposed to submit to any regular government. A contest between them and the British in 1774 ended in their defeat, and the destruction of their military consequence, which had for some time rapidly increased. Their commerce and manufactures, which had attained to distinction, suffered also a material check; and indeed it was impossible for them to prosper under the government of the nabob of Oude, to whom the country was assigned. Almost the whole of the district was ceded by that chief to the British in 1801; and from that period to 1815, the people, notwithstanding the unfavourable opinion prevalent respecting them, remained in a state of perfect tranquillity, and gave no trouble to the Company. In that year took place a sudden revolt of the Patan inhabitants about Bareily; but though alarming at first, from its being totally unexpected, it was soon quelled. Hopes are entertained, that the continuance of peace among them for some time, and the experience of its real superiority in point of happiness to a state of tumult and insubordination, will dispose them to habits more consistent with their own prosperity and the welfare of their neighbours. The inhabitants of one part of the district, Rampore, have already exemplified this desirable change.

The district of Bareily, which has the Kumaoon hills to the north, the nabob of Oude's reserved territories on the east, part of the same and the districts of Furruckabad and Alighur on the south, and the same districts with Moradabad on the west, may be considered as a part of Rohilcund. The people, too, are thought to be much disaffected to the British, to whom the district was ceded by the nabob of Oude in 1801; and the number of crimes which have been committed among them since that period is an unfavourable indication of their temper and habits. The chief towns of this district are, *Bareily*, above 900 miles north west from Calcutta, a large place, having nearly 70,000 inhabitants; *Shahjehanpoor*, 50 miles south-east from Bareily, which it is supposed to surpass in wealth, and almost to equal in population; *Pillibeet*, 32 miles north-east from Bareily, and the trade of which, once good, then decayed, is thought to be recovering; *Chundowsy*, 40 miles W. by N. from Bareily, at one time the great mart for salt in the province; and *Budayoon*, 29 miles south-west from Bareily, formerly a flourishing place, but now of small consequence.

The pergunnah of Khyreeghur, the capital of which is 100 miles north from Lucknow, is a territory of comparatively little value, and reckoned unhealthy, but which, if properly cultivated would in all likelihood become both fertile and salubrious.

Moradabad, a district forming the western portion of Rohilcund, of very variable fertility and improvement, contains about one million and a half of inhabitants. Its most valuable and abundant products are sugar and cotton, the increasing growth of which, as well as a decided advance in importance, may be fairly imputed to its being transferred to the British in 1801. The country was long sadly injured by large and formidable gangs of robbers, but these have nearly altogether vanished since 1814, in consequence of the exertions of the magistracy. The town of the same name is about 48 miles north-west of Bareily.

Rampoor, 39 miles N. N. W. from Bareily, is the residence of a Rohillah nabob, where the Afghan language and manners are still retained. It is the chief town of a district so called, and once contained above 100,000 inhabitants.

Nujibabad, 95 miles north-east of Delhi, is placed in a swampy country, but, though somewhat declined, is still of commercial distinction,

Saharunpoor, 90 miles N. by E. of Delhi, is the capital of the district of North Saharunpoor, which is a flat country, productive in grain, sugar, cotton, indigo, and tobacco, and is now under British government.

Hurdwar, another town of the same district, and held sacred by the Hindoos, is upwards of 100 miles north-east from Delhi. Besides the pilgrims who visit it, this place is a good deal frequented by merchants, and has a very tolerable trade.

The reason of its sanctity is the circumstance of its being at the spot where the Ganges issues from the northern mountains to spread over the plains of Hindostan; and, on the other hand, such is its estimation among merchants, that, at its two annual fairs, no less than two or three hundred thousand people have been known to be collected. When the religious feeling and the spirit of traffic combine together here in a high degree, as they do once in 12 years, the number that comes to Hurdwar is vastly greater,—amounting, it has been said, to nearly a million. In April 1809, it was even estimated at two millions. Formerly the fairs of Hurdwar were almost certain of being accompanied with bloodshed to no small amount; but the measures which were adopted by the British have prevented its occurrence, to the astonishment of the people. The chief ceremony of the pilgrims at this place, as will readily be imagined, is ablution, which is practised in the way of simple immersion, by both sexes indiscriminately, at a certain season of the year. It is when the planet Jupiter is in Aquarius at the time of the sun's entrance into Arius, which occurs every 12th year, that the extraordinary confluence of devotees takes place.

Merut, the capital of a district, is 39 miles north-east from Delhi. It fell into the hands of the British in 1803 with the rest of the district of Merut, which, from its lying to the south of the preceding, and being only judicially divided from it, has also been called South Saharunpoor. The attempt, in 1813, to establish an effective system of police in this district was for some time materially obstructed by local circumstances, which have probably given way.

Seerdhuna, one of the chief towns in the district of Merut, 47 miles north north-east from Delhi, is also the capital of a small principality, the gift of Nujiff Khan to an individual, a native of Europe, whose history and adventures are not a little marvellous. This was the noted personage Somroo, as he was latterly denominated; but whose real name was Walter Reinihard, which he changed to Summer. He was born in the electorate of Treves, entered early into the French service, and went out to Bengal, where he joined a Swiss corps, which he soon deserted. He then became a private trooper in the cavalry of Shuja ud Dowlah's father, whom he likewise abandoned; some time after which, he attached himself to Gregory, an Arminian, who was high in favour with Cossim Ali, nabob of Bengal, to whose notice he accordingly was introduced. Him also he left; and, after various changes, he terminated his singular course, in 1776, in the service of Nujiff Khan. His favourite concubine, well known by the name of Somroo Begum, long survived him, and is probably still alive. When this small state fell into the hands of the British in 1803, she had dexterity enough to have it exempted from the jurisdiction of the civil power. But she all along manifested a great degree of respect towards the British, and is understood to have managed the internal affairs of her state with much propriety.

Hustinapoor, 59 miles north-east from Delhi, is now an inconsiderable place, but is imagined to be on the site of an ancient city, highly celebrated in some of the mythological poems of the Hindoos.

In the west of the province of Delhi, where it approaches Ajmeer, and bounded on the north by some of the Seik territories, lies a large district of country generally called Hurriana, which includes several pergunnahs. It is also occasionally, but perhaps improperly, denominated the Lesser Baloochistan. Great part of it is level, and remarkable for verdure, whence probably the former name, *hurya* signifying green; but other portions are excessively arid, and consequently unproductive. The size and capabilities of this country, the character of its people, and the nature of its western boundary, which is so desert as to prevent the passage of troops by it, render Hurriana of high value to any power that possesses it. In the time of the Mogul glory, accordingly, it was held so important as to be usually considered a personal property of the heir-apparent to the throne. Since the dissolution of that empire, it has frequently changed masters, and latterly was transferred to the British; but, in reality, it has seldom acknowledged any authority in such a manner as to warrant its being considered perfectly subordinate to any particular form of government. Its recent change bids fair to prove the most efficient it has ever experienced, as, from the period of its coming under the sway of our countrymen, it is believed to have enjoyed a state of tranquillity unexampled in its history for many centuries. The inhabitants have been described as a warlike and rather a ferocious race, quite averse from the controul of a regular administration, and addicted to the lawless habits of an uncivilized banditti; and many circumstances in their behaviour, even in very late times, were calculated to confirm the repulsive character which had been given of them. But it has been found, that they are susceptible of feelings and sentiments which require only to be cultivated in order to redeem them to a condition of political and moral dignity.

The chief towns in this territory are, *Hissar*, which is rather more than 100 miles W. N. W. from Delhi, and was once of great extent, but now reduced to perfect insignificance; *Hansi*, 92 miles W. by N. from Delhi, which has a tolerably strong fort; *Bhowanny*, 82 miles west of Delhi, the inhabitants of which, by an attack on a detachment of the Company's troops in a time of peace, namely in 1809, provoked the storming of their town, which was captured with the loss of 136 men killed and wounded on the part of the British; and *Rotuk*, a large but decaying place with a brick fort, about 47 miles west from Delhi. The greater part of the northern border of Delhi is possessed by the Seiks, most of which, apparently to the satisfaction of the most intelligent and peaceable portion of the people, though not by any means to that of all the chiefs, are now under the protection and controul of the British government. It is admitted by the most competent judges, that the condition of these Seik states has been materially meliorated since the predominance over them of a power, which, while it coerces the vindictive and tumultuous passions that so long harassed them, fosters all those habits and qualities that contribute to the best interests of nations. *Patiallah*, the capital of one of these states, is a large and a prosperous town, surrounded by a mud-wall, at the distance of about 117 miles N. N. W. from Delhi. Next to it in importance, in the district of Sirhind, is *Thanusar*, an ancient town, once the capital of a kingdom, and held sacred by the Hindoos, situate 83 miles N. by E. from Delhi. *Sirhind*, formerly the capital of the dull and barren district so called, lies 140 miles north from Delhi. Once of great renown, and embellished with mosques, palaces, and the far-famed gardens of Hafez Rehneh,—it has sunk into ruins and desolation. The distance between Sirhind and Delhi consists of vast plains, in which are the towns of Paniput and Kurnal, and which are the scenes of some of the most terrible conflicts recorded in the history of Hindostan. Sirhind is directly in the route from both Persia and Tartary by which the invaders of this country proceeded to their conquests.

Ludeeana, a town on the southern banks of the Sutuleje, 170 miles N. N. E. from Delhi, was chosen and appointed in 1808, at the suggestion of lord Lake, as the station of a military corps, intended to protect the Seik states which had acknowledged British alliance, from the attacks of tribes still at variance. This measure has been found quite effective, and reflects great credit on the sagacity of the able officer who advised it. Several other places in this quarter of the province are known almost merely by name; but the position of the troops now alluded to, will probably ere long be the means of augmenting our information respecting them and the adjoining country.

7. *Lahore.*—This province lies between the 30th and 34th degrees of latitude, having part of the course of the Indus, Cashmere, and Little Tibet on the north; the country between the Sutuleje and Jumna on the east; Delhi, Ajmeer, and Moultan on the south; and the Indus, by which it is separated from Afghanistan, on the west. It is about 340 miles long and 200 broad; and consists of two parts, one called Kohisthan, which is a mountainous country occupying the north-eastern quarter, and the other, generally and long known by the name of the Panjab, which it derives from the circumstance of its being intersected by five rivers, though the term has been sometimes improperly extended to the whole province. This latter division is by much the more fertile, but its character in this respect is probably a good deal exaggerated. The climate of the first portion, the winter of which is little inferior in point of coldness to that of some of the central regions of Europe, is not favourable to fruits and vegetables, being too hot for those of Persia, and not hot enough for those of India; but the soil here is of excellent quality, and abundantly productive of grain. The country of the Panjab has a milder climate, and yields, in addition to grain, considerable quantities of sugar-cane, tobacco, indigo, and certain kinds of fruit. Formerly this division of Lahore carried on an extensive trade with various parts of Hindostan; but this has greatly declined, though what remains is by no means despicable. The inhabitants of Lahore, who have been estimated at no more than four millions, a small number for an extent of about 70,000 square miles, are composed of different races, as Mahommedans, Seiks, Jauts, Rajpoots, and other Hindoos of the inferior castes. The first are generally very poor, much despised, and subjected to several restraints and hardships, which bespeak their complete state of degradation. Many of the Seiks or Singhs have adopted the Hindoo faith. Such of them as are engaged in military pursuits, are noted for a courage amounting on some occasions to savage desperation. The Hindoo portion differs little from the corresponding castes in other provinces of Hindostan. Lahore, though divided among several chiefs, is only nominally independent,—those to the south of the Sutuleje claiming British protection, and being, in consequence, partly under British influence,—and those to the north of that river having been subdued by raja Rungeet Singh. All that seems wanting to render this province what its position, resources, and the character of its people point it out as capable of attaining, is a judicious system of government generally acknowledged and obeyed. It is at present ill cultivated, and wretchedly ruled.

Lahore, the capital of the province, is upwards of

1300 miles from Calcutta, and nearly 400 from Delhi. It stands on the south side of the Ravey river, which is here 300 yards wide. Its size, though still considerable, is greatly diminished from what it was, when it formed, as it did for a time, the seat of government during the Mogul empire. Having been frequently attacked and plundered, the wealthy inhabitants gradually abandoned it, and retired for greater security to *Amritsir*, the capital of the Seik nation, a town about eight miles in circumference, tolerably well built, 44 miles east from Lahore.

Puckely, a district in the north-west corner of Lahore, is inhabited by a set of people, who are so notorious for their savage and predatory habits that few persons venture to go among them. The consequence is, that their country is very little known. East of it are the two territories of the Bumbas and Cukkas, consisting chiefly of forests and mountainous tracts. The capital of the first of these is *Muzifferabad*, 63 miles west from Cashmere. *Attock*, on the east side of the Indus, which is there 260 yards broad, has greatly decayed in modern times. It stands on the site of Taxila, which Alexander reached, after crossing the Indus, on his route to India, in which, it is worthy of remark, as has often been noticed, he was followed, with little variation, by two other conquerors, Timour and Nadir Shah, men of very different characters, and entertaining very different views. The fort of Attock, though neatly built, and apparently strong, is commanded by a neighbouring hill, and consequently cannot be much relied on as a place of security against a well provided enemy.

Rotas, a strong fort belonging to the Seiks, is 107 miles N.N.W. from Lahore.

Augur, one of the subdivisions of that part of Lahore which lies between the Indus and the Hydaspes, contains several salt mountains,—a peculiarity not unusual in this quarter of Hindostan.

Leia, a district lying along the east bank of the Indus, of which the capital, a town so called, is a small place, has a race of people for its inhabitants who are noted for the superiority of their manners and appearance to those of more southerly territories.

At *Calanore*, 30 miles north from Amritsir, the emperor Acber was first proclaimed, in 1556.

Kangra, a tolerably sized town, 90 miles north-east from Amritsir, has a fortress of great strength, and capable of accommodating 3000 or 4000 men. This place is the capital of a district, which was overrun by the Gorkhas.

Cooloo, a country north of Kangra, was the principal channel by which the shawl trade was carried on with Upper Hindostan, and, it is imagined, might still be advantageously employed for the purpose of transmitting the raw materials for the British manufactures.

Mundi, to the south of Cooloo, is a small but fertile country.

There are many other territories and towns in Lahore, especially towards the north, and on the border of the Indus, which are either comparatively little known to Europeans, or present few objects of general interest. The position, magnitude, and relations of the five rivers, whence part of this country has derived its name, are among the most curious topics of eastern geography.

8. *Cashmere.*—This greatly celebrated country lies between little Tibet and the province of Lahore. It has been variously estimated as to dimensions, from 80 miles long and 40 broad, to 110 in length and 60 in breadth. It is of an oval shape; is encompassed on all sides by mountains; is plentifully supplied with excellent water; has an abundant natural vegetation; yields generous returns to the labourer; has a fine climate; and every where exhibits such appearances of fertility and beauty, as to procure for it the denomination of a garden in perpetual spring. This, at least, is the description which has long and often been given of it, though there are some reasons for believing, that its present state is not altogether so deserving of these high encomiums. It is liable to earthquakes, for which reason the houses are mostly built of wood; and it is much infested with various kinds of small vermin, such as bugs, lice, gnats, though comparatively free from snakes and other venomous reptiles. The breed of horses is small, but hardy; and neither the camel nor elephant is reared in this province, which is thought unsuited for both. The lower ranges of the hills which surround it, and many of the higher lands in the interior, yield admirable pasturage for all sorts of cattle and wild graminivorous animals. Lions and tigers, and other ferocious creatures, are rarely or not at all to be found in it. From the elevated lands which are in and about Cashmere, flow innumerable streams into the valleys; and these are of essential utility in the culture of rice, which forms the chief support of the inhabitants. But, besides these streams, there is a great number of lakes in this province, many of which are connected with the Jhylum, a river that intersects the whole country. This particular arrangement seems to confirm the opinion prevalent among the inhabitants, that Cashmere was once the bed of a large lake, which at last found a passage into Hindostan.

The mountains round Cashmere are the abode of several tribes nominally dependant on the Afghan government, but in all probability little subject to any other authority than their own wills. They are not well known, and do not often visit the low countries; but, on the whole, it is believed, are not so uncultivated and savage as to render it any way hazardous to go among them. The inhabitants of Cashmere itself are a good looking people, of rather brownish complexions, lively in their manners, sagacious, if not crafty, in their dealings, somewhat attached to a sort of literature derived partly from a Sanscrit source, fond of amusements, but probably still fonder of wealth, and have the bad repute of being egregious liars. The females are reckoned beauties, and as such have long been sought after by the nobility and rich persons of the neighbouring provinces. The amount of the population bears a very small proportion to the excellence and powers of the soil; a circumstance partly owing to the wretched government of the country. It is thought scarcely to exceed half a million, of which it is singular enough the capital is supposed to contain fully a third part. There cannot be a doubt that this wonderfully fine region needs only a better political system than it now has, if so near an approach to a state of anarchy deserve the title, and the introduction of liberal and enlightening principles, to render it one of the most eligible countries in the world. Its history may be briefly mentioned. In early times it was a region of great consequence among the Hindoos, who still reckon it holy; and it is said to have had a long series of sovereigns, to have possessed many splendid temples, and to have been one of the chief seats of Brahminical learning, before it attracted the attention of the Mahommedans. The date of its first subjugation by these military religionists is not well ascertained; but it is known that Mahmood of Ghizni ravaged it so early as the beginning of the 11th century. After this it fell into the hands of the Tartars of the Chug or Chagatay tribe, to whom it remained subject till towards the close of the 16th century, when it was subdued by Acber, who added it to the Mogul empire, in which condition it was held till the reign of Ahmed Shah, sovereign of Cabul, from whose time it has formed a portion of the Afghan dominions. The people at first rebelled against this power, but were ultimately brought to submit to it, and were long completely enthralled by the vigorous measures of their conquerors, who used them much more like slaves than free beings. This most injurious treatment must be partly ascribed to the character of the individuals whom the kings of Cabul usually appointed as their representatives in this province. Since 1809, Cashmere may be considered as independent of Cabul, the viceroy or soubahdar having thrown off his allegiance, and hitherto, it is supposed, contrived to elude or defeat the attempts of his sovereign to reduce him. But this revolution has unfortunately yielded no alleviation to the people, whom he is said not only to rule in the most despotic manner, but also to subject to such restraints and grievances as, while they are intended to prevent their aiming at or accomplishing an emancipation, utterly destroy their respectability as a nation, though they do not, it is believed, lessen their excessive propensity to animal indulgences.

As much of the real consequence, no less than the fame of Cashmere, is to be attributed to a particular manufacture in which it excels, it would be unpardonable entirely to pass over the subject without notice. The wool from which the shawls now alluded to are produced is not the growth of this province, but comes from the high table land of Tibet, where alone the shawl-goat, as it is called, is known to thrive. It is a sort of down, at first of a dark grey colour, but bleached in Cashmere by means of a particular preparation of rice, and then subjected to a process of weaving in looms, each of which occupies two or three men, and the entire number of which within the province has been estimated at 16,000. The labour of working these goods is carried on very slowly, especially in the finest and most variegated sorts,—so that the space of a year is sometimes required by three persons to complete a single shawl, of which not more than a quarter of an inch in size will have been wrought by them in one day; whereas, of the coarser and plainer patterns, six or eight may be made in the same period. It frequently happens that shawls which require much work are the product of different shops, in which its component parts have been separately made; and thus it is quite usual for these pieces to be found not exactly to correspond in size when they are brought together to be united. When finished, the shawls are taken to the government custom-house where they are stamped, and have a certain duty imposed on them, that amounts to a fifth part of their highest possible worth. They are generally unwashed, when disposed of to the merchant. At Amritsir, the greatest mart for them, or at other places in the vicinity of Cashmere, they are cleaned and packed, so as to be fit for transportation to distant countries; but those which are sent to the westward are often worn just as they have been taken off the loom. It is probable that the trade in shawls, as well as in writing paper, for which also Cashmere used to be famed, and in some other articles, has declined of late years.

Cashmere, the capital of this province, upwards of 1500 miles from Calcutta, 587 from Lahore, and 724 from Agra, is built on both sides of the Jhylum, over which there are four or five wooden bridges. The houses consist commonly of brick and mortar, with a large addition of timber, and are covered at top with earth, which is often planted with flowers. The streets are narrow and proverbially filthy, which is quite the character of the people. There are no buildings of much note in this town, which has been described as altogether a romantic-looking place, and, though considerably declined, as containing from 150,000 to 200,000 inhabitants. A fortress called Chereghur, in the south-east quarter of the city, is the abode of the governor of this province. The fine lake called Ouller, and sometimes Dall, in the immediate vicinity, is about six miles in circumference, contains a number of small islands, is bounded at some distance by a range of hills, and altogether adds amazingly to the beauty and interest of Cashmere.

Islamabad, 29 miles east south-east from Cashmere, is a large town on the north of the Jhylum. Scarcely any of the other towns in this province deserve particular notice; and the interior has been so little visited by Europeans, that it may still be reckoned a *terra incognita*.

9. *Ajmeer*, or *Rajpootana*, lies in the centre of Hindostan, and is bounded by Mooltan, Lahore, and Delhi on the north, Delhi and Agra on the east, Guzerat and Malwah on the south, and Mooltan on the west. It is a large province, being about 350 miles long by 200 broad. Generally speaking, it is neither very agreeable in appearance nor very fertile. The northern parts are flat, barren, naked, very ill supplied with water, and thinly inhabited. Towards the centre the land becomes more elevated and irregular. Water is a little more frequently met with, but is still so scanty as to stint vegetation. The best and most variegated portion is in the south, where hills are abundant, trees are common enough to relieve the eye, streams are in such number and of such size as to afford nourishment to plants, and the soil, though not very rich, is capable of yielding pretty fair returns to the labourer. One of the most

inconvenient peculiarities of Ajmeer is the predominance of a loose sand on the surface of the ground, which is so extensive in some districts as absolutely to constitute a desert, and which, moreover, by its lightness, is readily raised up by the winds, and thus carried from place to place in a manner most threatening and dangerous to the travellers who may happen to be exposed to them. In the territories where this is most common, it cannot be expected that there will be many inhabitants. A solitary hut, or a miserable village, is all that can be seen in them through a large tract; and then the wretched attempts at cultivation in the vicinity indicate infallibly the unhappiness of the inmates. It is enough to mention, as a proof, the single circumstance of its being often found necessary to dig to the depth of 300 feet, in order to procure a little brackish water. Here, therefore, as in some other parched countries, the possession of wells is one of the most decisive evidences of wealth; and such is their well known value, that in the apprehension of any hostile attack, the natives contrive, by covering them up with boards on which sand is laid, to render invasion an extremely hazardous enterprise. The water-melon is said to be frequently met with in those parched lands, and to attain to extraordinary perfection, to the great relief of the thirsty traveller. What is called the mirage, an optical deception not uncommon in sandy deserts, is sometimes seen in the vast arid plains of Ajmeer. The soil of this province abounds so much in saline matter as to yield salt and saltpetre spontaneously, and in great quantities in certain districts. The only rivers worthy of being noticed, are the Banass, Calysind, and Chumbul in the southern quarter. In point of climate, Ajmeer may be said to have a mild winter and an intensely hot summer. The chief animals found in Ajmeer, besides those which are domesticated, are the wild ass, the antelope, the fox, and the desert rat.

The common people who inhabit the desert are chiefly Juts, who are small of stature, of black complexions, and have the aspect of complete poverty. Those of the higher orders are tolerably good looking, and of a robust make.

This province has been variously partitioned at different periods. Its principal divisions at present are Odeypoor, also called Mewar and the Rana of Chitore; Joudpoor, or Marwar; Jeypoor, otherwise denominated Jynagur, or Ambeer; the rajahships of Jesselmere and Bicanere; and the chieftainships of Kotah, Boondee, and Banswara. A short time ago it would have been requisite to add the possessions forcibly obtained by the invaders Sindia and Holcar, the first of whom held the town of Ajmeer, and 46 pergunnahs in its neighbourhood; and the second, a district called Tonk Rampoora. The original inhabitants, or Rajpoots, whose states have just now been mentioned, seem to have a political constitution which greatly resembles that of the feudal system, and in which almost every little village and territory is governed by its own chief, who, while he acknowledges the authority of some superior, is almost altogether independent. The amount of population probably does not exceed three millions, of whom the Mahommedans form only about a ninth part.

As to history, Ajmeer is remarkable chiefly as having never been entirely or even in a great degree subdued, though it was certainly visited and sometimes overran by those powers which conquered the most of Hindostan; and this is the more singular, as it is not only placed in the centre of this region, but is also within a hundred miles of Delhi, the seat of government during the Patan and Mogul empires. It was indeed tributary for some time to the Delhi sovereign; but, besides being occasionally punished for refractoriness, it cannot be said to have ever formed a regular component portion of his dominions. It nevertheless furnished troops for the empire, and these always held a high character for their military qualities and fidelity. This sort of nominal dependence which it acknowledged continued till about the middle of last century, when it was entirely thrown off, and the native princes established themselves in perfect separation from every other state. But soon afterwards the country began to be troubled with various internal dissensions, and at the same time to be hostilely visited by the Mahrattas and other predatory tribes. From these latter evils, which were most vexatious and threatening, during the reign of Madhajee Sindia, and the early part of that of his nephew, Dowlet Row, they were materially relieved in 1803, when the insolence of the latter provoked the vengeance of the British government. Since that time they have suffered not a little from their own mutual altercations, as well as the intrusion of their troublesome neighbours; and such were their sufferings from both causes, but especially the latter that they repeatedly sought to be taken into alliance with the only power which could afford them security. Sundry reasons withheld the British from acceding to their successive applications, till 1818, when they were admitted into an alliance, which promises to answer the double purpose of preventing their attacking one another, and protecting them from the assaults of their common foes. It was most effectively followed up by that active officer Sir David Ochterlony, to whom this province is essentially indebted for its liberation from the most threatening calamities, and the establishment of a state of prosperity which it had never before enjoyed.

The town of *Ajmeer,* formerly the capital of the province which takes its name, is upwards of 1000 miles from Calcutta, and about 230 from Delhi. It is built at the foot of a hill, on which there is a fort of no small strength, and is rather a dirty and certainly a decaying town, without any remarkable object save the tomb of Khaja Moyen ud Deen, a Mahommedan saint, held in high estimation by the votaries of this faith. The country round Ajmeer is flat and sandy, but water is abundantly supplied by two lakes close to the walls of the city.

Kishenghur, 19 miles N. N. E. from Ajmeer, is the capital of an independent principality.

The territory of the Bhatties, which lies in the north-east quarter of Ajmeer, has only lately been introduced to Europeans, and is still very imperfectly known. Its soil is said to be tolerably productive, and good pasturage is to be met with in it; but the inhabitants are more addicted to thieving than honest industry, and seem to have paid little regard either to the remonstrances of the British, who were at length induced to complain of their conduct towards some of the allies of the Company, or to the injunctions of their own chiefs, who had sagacity and good principle enough to perceive the evils which they were both occasioning to others and bringing on themselves. More energetic interference, therefore, became necessary, and proved effective,—Futtehabad and its adjoining towns submitting, on the appearance among them, in 1810, of a sufficient force under the command of colonel Adams. Matters kept quiet till 1818, when a restless spirit having again manifested itself, another detachment was marched into the district, expelled the unruly, destroyed the forts, and compelled tranquillity.

Bhatneer, the present capital of the Bhatties, stands in latitude 29° 36′, longitude 73° 55′, and is a place of some antiquity. *Futtehabad*, *Sirsah*, *Raneah*, and *Batindah*, other towns in this district, do not present any thing worthy of being particularized.

The principality of Bicanere, in the middle of this province, agrees generally with the description already givenof the central portion. It is by no means a very enviable territory, either as to its physical peculiarities or the character of its people. Its capital of the same name is about 260 miles W. by S. from Delhi, and stands in the midst of a wretched looking country. The natives reckon it a strong place; but perhaps the desolateness that surrounds it is its best defence.

Chooroo, 107 miles W. by N. from Bicanere, is the second town in the district, and is on the whole a good looking tolerably sized place.

The principality of Jesselmere, in the west of Ajmeer, is remarkable for barrenness, which is partly owing to its abounding in sand, and being very sparingly favoured with water, but partly also to the wretched government under which it labours. It now participates in the protection of the British. It has no town of much consequence.

Joudpoor, a Rajpoot principality, which constituted a good deal of the central and eastern part of Ajmeer, and which was formerly called Marwar, is very extensive, partially cultivated, and moderately fertile; carries on some trade; was much exposed to the attacks of Sindia, Holcar, and other plunderers; but is now in alliance with the British government. The capital so called is upwards of 300 miles south-west from Delhi.

Nagore, the chief town of a Rajpoot district, is about 70 miles N.N.E. from Joudpoor.

The district of Shekawutty lies to the east of Joudpoor and Bicanere, is chiefly a sandy plain, ill watered and as ill cultivated, and has several considerable towns, but none of them deserve any specific mention.

Jeypoor, a Rajpoot principality, to the east of the districts of Ajmeer and Joudpoor, is indifferently watered, but presents many agreeable spots, which are tolerably cultivated; has a little trade, and is, on the whole, the most prosperous and best peopled territory in the province. But its government, and the succession to its throne, have been much unsettled of late; and its connection with the British has been of too short duration to yield all the advantages of which it stands in need. Its capital, also,

Jeypoor, 150 miles S.S.W. from Delhi, is an uncommonly handsome town, under the protection of a citadel of moderate strength.

Amber, the ancient capital, lies about five miles north-east from it.

Samber, 51 miles N.N.E. from Ajmeer, is in the neighbourhood of a lake which supplies much of Upper Hindostan with salt.

Tonk, 50 miles south from Jeypour, belongs to the Holcar family.

Rampoora is an extensive and populous place, 70 miles S. by E. from Jeypoor, where a part of Holcar's army was defeated by general Brown in January 1818.

The territory of Kotah, which has for its capital the large town so called, situate 150 miles south-east from Ajmeer, is one of the Rajpoot territories, now in alliance with the British.

Boondee, another of them, long oppressed by Sindia and Holcar, but now relieved by the same powerful interference, is recovering from its distresses. The chief town, also *Boondee*, in lat. 25° 28′ long. 75° 30′, is built on the south side of a long range of hills, and contains the palace of the raja, which is a large stone edifice. None of the other towns is very remarkable.

At the southern extremity of this province lies the large and important Rajpoot principality of Odeypoor, which may be said to comprehend the districts of Chitore and Mewar, and to contain upwards of 7000 square miles. It is chiefly to this country that the favourable description of one part of Ajmeer belongs; and, in addition, it may be mentioned, that the number of naturally strong places and intricate passages in it are so great, as to render this territory one of difficult conquest, but easy defence. Of this the natives appear to be well aware; but, unfortunately, they have so far abused their advantages as rather to convert them into sanctuaries for the refractory, than to have recourse to them for the honourable purposes of a civilized people. The inhabitants are, notwithstanding, of a high race, especially those of rank among them; and the Rana himself is reckoned the most noble of the Rajpoot chiefs, though inferior in power to those of Jeypoor and Joudpoor. The lands are generally held here by a kind of feudal tenure; but, latterly, in consequence of the distracted state of the rana's affairs, and the deficiencies of his personal character, added to a condition of mind bordering on insanity or fatuity, the government dues have been a good deal in arrear, and can rarely be recovered without an appeal to force. Repeated invasions of his dominions, on the part of Madhajee Sindia, had, moreover, so completely broken the attachment of many of his subordinate chiefs, that he no longer seemed to maintain any authority over them; and his own long continued subjugation under the Mahrattas had both reduced him to poverty and destroyed any energy of mind he had ever possessed. Such was the distressed and ruinous situation of this territory and its prince when the British extended protection towards them in 1817-18; and such, on the other hand, has been the success of that friendly alliance, that though the British never interfered with the management of internal affairs, there has already taken place such a material and visible change, that hopes may be safely entertained of decisive improvement. Thus, when captain Tod visited the rana's court in 1818, he found it attended by several chiefs who had not been there for many years, and others who had never been there at all. Still, it is admitted, that considerable talents, and great propriety of conduct, will be required in the rana himself, or his native counsellors, in order to secure the prosperity of Odeypoor.

The capital of this principality is a town of the same name, on the south side of the Banass river, and is encircled with hills in such a manner that there remains only a single narrow pass by which it can be approached by a carriage, though there be two other passes sufficient for single horses.

Chitore, which lies north-east of Odeypoor, has long been celebrated, among other things, for its strong fortress, which is on the top of a high mountain, and is said to be eight miles in circumference.

The district of Sarowy, in the south-west quarter of Ajmeer, is partly desert and partly of very moderate fertility, is thinly inhabited by a poor and predatory people, and has a town of the same name, situated 62 miles west from Odeypoor, for its capital.

Amercote, 85 miles east of the Indus, where Hyderabad stands, was once the capital of an independent principality, and is the birth-place of Acber. It has been in various hands, and is now probably in possession of the ameers of Sinde, whose territories it adjoins.

10. The province of Mooltan, or Multan, may be said generally to run along the course of the Indus, from Lahore to the ocean, or, still more strictly, is comprehended between the Sutuleje, the Ravey, and the Chinaub, and is 110 miles long from north to south, and about 70 of greatest breadth. It is on the whole a wretchedly sterile country, rarely interspersed with any agreeable or fertile spots, and has moreover almost constantly suffered from the inroads of depredators belonging to the Seiks, Afghans, Sindians, and other tribes. Part of the country to the west of the Indus used to be comprehended under this name; but the restriction now stated is generally recognized in modern times. The chief divisions of this province within the limits mentioned, may be summarily described, beginning with the most northern part. Mooltan Proper is little known to Europeans,—its distant position, natural inferiority, and political insignificance, presenting little or no inducement to visit it. By all accounts, it labours under a miserable government, and is a prey to internal as well as external vexation. *Moultan,* its capital, the supposed Malli of Alexander's days, stands in rather a pleasing and tolerably cultivated country, in latitude 30° 9′, longitude 71° 7′. It is noted for silk manufactories, and also a sort of carpeting, inferior to that of Persia. Nominally it is under the protection of the Cabul sovereign, who is either unwilling or unable to secure it from the hostile visitations of the Seik raja of Lahore, and the ameers of Sinde. At present it is imagined to be in the power of the former chief.

The territory of Bahawulpoor, a very little of which is said to be either capable of cultivation or to have received it, extends 280 miles from north-east to south-west, and 120 from north-west to south-east, has several towns, of which the chief are, *Bahawulpoor,* within a short distance from the union of the Beyah and Sutuleje, noted for its silks, and inhabited both by Mahommedans and Hindoos; *Ooch,* 75 miles S. by W. from Mooltan, formerly of some note, and which has given name to a dialect; and *Moujghur,* which has some pretty good buildings and a fort, situate 40 miles south-east from Bahawulpoor.

Backar is a territory apparently sinking most rapidly into a state of desert, political and physical. At one time it seems to have been watered by a branch of the Indus called the Nullah Suncra, which has become so small as to be quite inadequate to nourish the sandy and ungenerous soil. The town of the name is thought to be garrisoned by the Afghans, who are perhaps the chief masters of the whole region.

The principality of Sinde, only part of which is comprehended within the limits assigned above to Mooltan, but all of which was included in the larger country formerly so called, occupies both sides of the Indus, having Afghanistan and Bahawulpoor on the north, the sea and part of Baloochistan on the west, Cutch and the sea on the south, and part of the same province with Ajmeer on the east. Taken in this manner, it is about 300 miles long by 80 broad, and is divided throughout its length by the Indus. The portion of it which lies east of that river is quite level, with the exception of a few small hills; and that on the western bank of the Indus is partly flat and partly mountainous. A good deal of it is liable to inundation, and, by that and other circumstances, resembles Egypt, with which it has often been compared. On some of the lands in the neighbourhood of the river, cultivation, which is greatly regulated by the periodical rains, has been somewhat liberally disposed; but, probably, the larger proportion of the country remains in a very neglected state. On the whole, the climate is moderate, and, towards the north of the province, is rather of uncommon salubrity and pureness. The chief exports of Sinde, for it has no insignificant trade, are various medicinal articles, rice and other grain, indigo, hides, and leather; whilst it imports several of the metals, some European goods, and certain silk and other manufactures from Persia and the adjoining countries. Its possession of the Indus affords most extensive facilities to internal navigation. But, unfortunately for Sinde, the revolution which has subjected it to its present rulers has proved most injurious to its commercial character and interests.

The government now established in it is a military despotism, and seems to vindicate its nature by an almost exclusive encouragement of military adventurers. These are chiefly Mahommedans of the Soonee faith, the labouring classes and those who engage in trade being mostly Hindoos, who are probably the original inhabitants of the province. It is not all under one head, but divided among the members of the same family, who are, in a great measure, independent of each other, though they acknowledge a connection, and are nominally subordinate to the oldest representative. What the amount of population is cannot be known with any degree of precision; but one thing is certain, it has greatly declined of late years. In point of appearance the natives are a fine race of beings, and the females, more especially, are very good looking. They are not so much confined as in other parts of this region.

Sinde is the first conquest of the Mahommedans in Hindostan. It was for a short time subject to the caliph of Bagdat, after which it seems to have been divided between a Rajpoot and a Mahommedan family, with the first of whom part of it remained a possession for about 500 years. Then the chiefs of various separate tribes got hold of it. Of these a Turkanny family seems to have been most conspicuous, and to have retained the sovereignty until the time of Acber, who added it to his other dominions. It afterwards became tributary to Nadir Shah, though under the government of chiefs of the Calorie race. Another change occurred about 1779, when a tribe of Baloochees successfully rebelled against the representative of that family. Timour Shah of Cabul, who was applied to by his successors, engaged to give them assistance, but falsely abandoned them on an offer of annual tribute, which was diminished after his death in 1792, and at length altogether discontinued. At present there is but a small portion of the province possessed by the descendant of the Calories, all the rest being portioned among the Talpoory ameers. Holcar attempted in 1809 to unite these chiefs with himself against the British, but unavailingly, as his envoy was not well received.

Hyderabad, the capital of Sinde, three miles east from the main channel of the Indus, has a fortress of some apparent but little real strength, and contains about 15,000 inhabitants, many of whom are engaged in various trades, in which they manifest a degree of industry and skill that only needs the countenance of a judicious and humane government to prove important.

A place, 30 miles south-east from Hyderabad, called *Taunda*, is large and prosperous as a commercial mart for northern traders, and at the same time forms the residence of a relative of the reigning ameer.

Nusserpoor, the capital of a district, is 20 miles north-east from Hyderabad.

The large district of Tatta has Sinde on the north, the main branch of the Indus on the east, the sea on the south, and the sea also and Baloochistan on the west. It is throughout an inhospitable sterile desert-like country, most sparingly relieved by any appearances indicating either the bounty of nature or the industry of man. Yet it cannot be doubted that it was formerly in a more agreeable condition, if not in a state of prosperity,—as witness the many ruins of buildings, which can only be accounted for on the supposition of its having been pretty well inhabited. How far the nature of the climate, or other physical circumstances, may be concerned in its decline, it is not easy to determine; but unquestionably the wretched government which has for some time existed in it, or rather the system of oppression under which it has groaned, must come in for a large share of blame in accounting for it. For about 40 years it has been subjected to the iron sway of the ameers of Sinde, who seem to own no other principle of administration than that of extorting what they can from those who have the misfortune to be within their power. In point of history, it is enough to say of this province, that it was early conquered by the Mahommedans,—that it was considered an appendage of the Mogul dominions, though probably not subdued by Acber, till towards the end of the 16th century,—and that, since the dissolution of that empire, it has shared in the fortune of Sinde.

Tatta, the capital, stands on the banks of the Indus about 130 miles from the sea, and at the distance of 1600 miles from Calcutta. It is placed on a small elevation in the middle of a plain which is often covered with water, so that the town has sometimes the appearance of being an island. Its houses are of mean construction, and the streets are narrow and filthy. It had a wall round it in former times, and some other marks of being fortified; but these, with any symptoms of elegance, have almost entirely vanished, and nothing is more conspicuous in it than its rapid tendency to decay. The population has been estimated at 15,000. In the neighbourhood of Tatta are several burying grounds and mausoleums, the extent of which implies the former existence of human beings to an amount greatly exceeding those who survive. The country round this town is represented as possessed of a fine soil, that needs only proper attention to become amazingly productive.

Corachie, the chief sea-port of this territory, lies upwards of 50 miles west of Tatta. The other towns in this district are little better than villages, and do not merit enumeration.

A tract of country called Chalchkaun, of which very little has been known till lately, is bounded on the north by Ajmeer, on the east by Guzerat, on the south by what is called the Runn, and on the west by Sinde. It is sandy, parched, very sparingly cultivated, but possessed of some pasturage, and is inhabited by various tribes in a low stage of civilization, and much more addicted to robbery than to labour. But they generally make good soldiers,—such at least as the predatory chieftains who employ them require. The better part of the people seems to consist of those who lead a pastoral life. Though several of the native chiefs in this country are independent, the power of the ameers of Sinde is predominant in it; and many of the inhabitants, being originally from that state, regard it with a patriotic affection, which induces them to desire their remains to be interred there. Some idea may be formed ot the pagan darkness which reigns over this desolate region, from what is related of the adoration paid to the Hindoo idol Goreecha, a figure cut out of a piece of white marble, which, though without any temple, and either carried about from place to place, so as to suit the convenience of the proprietor, or occasionally hid in the sand, in order probably by concealment to increase its interest, is frequently sought after by devotees from a distance, and at times worshipped by people to the amount of many thousands. The raja who possesses this deity is said to derive a large income from the offerings that are made to it.

Nothing of any moment can be said of any of the towns in this territory.

11. The very singularly placed province of *Cutch* has the district now described on the north, Guzerat on the east, the gulf of its own name and the ocean on the south, and Sinde on the west; and, including the Runn already alluded to, is reckoned 140 miles long by 95 of breadth. Any information respecting it has been only recently acquired, the consequence chiefly of the territories of the British having approached so near to it; and this is by no means so ample or satisfactory as, there is reason to think, the importance of the subject demands. Part of the district seems to be hilly, but is clothed with verdure, and capable of cultivation; and even those portions of it which bear a somewhat different character, are not so bleak and barren as much of the previously described country. Still the soil is on the whole poor, and the scantiness of water is a formidable obstacle to improvement. It yields an indifferent sort of cotton with tolerable facility, and also some grain; and in various places there have been discovered both coal and iron, which might turn to account if properly managed. Cutch is inhabited by various tribes, most of whom boast of independence. This, it is very likely, they will long enjoy, as the nature of the country, its position, and the precautions which have been taken by the people to defend their little villages, are calculated to render invasion hazardous to an army that is not amply provided with the most powerful instruments of war,—whilst it is difficult to conceive the existence of an adequate temptation to conquest on the part of one that might be able for the undertaking. The most assailable point on which it may be attacked is undoubtedly the sea, and hence it may be inferred what power would be most likely to atchieve its recovery from the barbarism in which it is immerged, should circumstances arise to justify an attempt, which, notwithstanding every maritime advantage, would assuredly be accompanied with danger, and might excite, among the highly martial Cutchies, a spirit of resistance by no means easily subdued. The policy of the British government, therefore, in gradually extending its benign influence over this region, so as to promote a friendly understanding with the people, soften down the ferocity of their manners, and put a stop to the most inhuman of their depravities, especially infanticide, so common in Cutch, is much more to be commended for its expediency and greater probability of ultimate success. Recent events, both in the external relations and the internal disquietudes of this province, induced a more direct interference in its concerns than seems to have been wished or expected on the part of our countrymen; but it is decidedly agreed on by those who are best acquainted with this district, that it is far better it should remain in a state of independence, which costs us nothing, than become a component but expensive member of our dominions.

Bhooj, the capital of Cutch, lies in lat. 23° 15′, long. 69° 52′; is a very strong, though irregular fortress; and possesses a defence in the adjoining hill-fort of *Bhoojea*, which was taken in 1819 by Sir William Keir, who had been sent to depose the reigning Row, and to place the lawful heir on the throne. It is, perhaps, still garrisoned by the British, in order to preserve peace.

Mandavie, the chief sea-port of Cutch, upwards of 30 miles S. S. W. from Bhooj, has an excellent harbour. *Luckput Bunder*, which has a tolerably strong fort, and upwards of 2000 inhabitants, is the principal town between Hyderabad and Mandavie.

Anjar, the capital of a district ceded to the British in 1816, is a moderately fortified town, ten miles from the gulf of Cutch. It surrendered, in the year now mentioned, to a detachment under the command of colonel East, who was chosen to conduct certain operations intended to secure the tranquillity of this province. It is an incident shockingly characteristic of the people in whose territories he had entered, that, on marching towards Bhooj, he discovered that arsenic had been put into the tank whence his troops were to procure water,—a practice which, he was informed, was extended to all the wells in his intended route. *Rohur*, the chief sea-port of Anjar, is 12 miles E. by S. from the town so called.

The only remaining portions of Cutch which deserve to be mentioned here are the Runn and Wagur. The first of these, formerly alluded to, is a salt morass, which extends from Luckput Bunder to Guzerat, and is from five to 80 miles broad. When largest, for it varies in dimensions according to the seasons of the year and the state of the adjoining river, it is connected with the gulf of Cutch on the west, and the gulf of Cambay on the east, and may be estimated at 8000 square miles superficies. It is a dead level throughout; consists chiefly of a sandy earth, mixed with or encrusted by a thin stratum of mud, and occasionally covered with water to the depth of a few inches; assumes different appearances at different times; is frequently strewed over with prawns, mullets, and other fish; is visited by large birds, apes, porcupines, and wild asses, the last of which confine themselves to its banks; and at times admits of being crossed both on foot and on horseback, while at others it is almost entirely impassable by either. It is highly probable that at one period, though a very distant one, it was altogether under the waters of the ocean, which, by gradually subsiding, have left it in its present amphibious state. Wagur, a district which forms the eastern portion of the province, is almost quite surrounded by the Runn and the gulf of Cutch. From the interior, which is somewhat elevated and woody, there issue several streams that fall into the Runn. The inhabitants are Mahommedans, and are of such predatory habits as to have procured for their country the title of the Wagur of thieves. Formerly the nabob of Rahdunpoor, a town in Guzerat, held a considerable portion of this district tributary; in later times the superiority of the whole has been claimed by the Row of Cutch, who, though befriended by the British government, is imagined to be very unlikely to support his pretensions. The people are said to prefer the authority of a respectable and efficient foreigner; but, whether or not this has been reported, in order to account for any projected designs on the district, time will probably shew.

12. *Guzerat*, *Gujrat*, or *Gujerat*, lies between the 21st and 24th degrees of latitude, and has Ajmeer on the north, Malwah and Khandesh on the east, the sea and Aurungabad on the south, and the sea and Cutch on the west. It is about 320 miles long by 180 broad; and is variously characterized as a country in different quarters. Thus the western parts are either flat and parched or swampy, so as to resemble the Runn; whilst in the east is found a great deal of hilly land covered with jungle; and much of the central portion is hilly and rocky, interspersed with verdant, but very moderately fruitful spots. This province is pervaded by several rivers, as the Nerbuddah, Tuptee, Mahy, Mehindry, and Sabermatty; but there are considerable tracts where water is very scarce. In point of soil this province is not to be highly esteemed, and consequently its vegetable products are neither plentiful nor peculiarly valuable. Opium used to be cultivated in it for exportation, till discouraged by the British government, lest the Bengal monopoly should suffer; but the inhabitants, who use large quantities of it for the purposes of intoxication, procure it from some of the neighbouring countries. The internal construction of this province presents great difficulties to an attempt at conquering it; and accordingly it can scarcely be said to have ever been entirely subdued by any foreign power. It contains an extreme diversity of inhabitants, only the most remarkable or important of which need be enumerated and described. Under the term Grassias, the etymology and precise meaning of which have not been well determined, are comprised such very different sorts of people as Hindoos of several tribes, Mahommedans of any sect, and even Christians; nor is it very easy to ascertain any other common principle in which they participate, so as to be thus nominally classed together, than that they are claimants to be either proprietors of certain lands, or to hold a sort of feudal sovereignty over them. But whatever may be the nature, the dates, and the causes of their pretensions, they have long occasioned immense trouble and mischief in this province, by the altercations and disputes which have necessarily arisen from the number and the contrariety of their interests; nor has the intervention of British sagacity and justice been hitherto able either to unravel the intricacies, or to decide the merits of their multitudinous and conflicting pleas. Coolies abound in Guzerat, where they exhibit the profligacy and savageness of manners by which they are elsewhere so well recognized. Here, too, in great numbers, are those individuals who are denominated Bhatts or Bharotts, a class of beings less remarkable for any personal peculiarities than for their occupations. They are recorders of deaths and births, approach somewhat to the character of the bards in other countries, and engage occasionally in trade in the manner of pedlars; but are still more distinctly known as persons who become securities or guarantees both for public revenue and the fulfilment of private debts or other obligations. In some measure connected with them are the Charons, who are found of great use as guides and protectors of persons who have to travel in this and other provinces. Both of these are religious orders of the Hindoos, and enjoy no small respect among their countrymen of the same faith. A class of people called Ungreas, whose chief occupation is that of carrying money as messengers, consists of persons who belong to different castes. The Dheras are a low caste, who are generally engaged in very inferior businesses, and are reckoned quite disreputable; but this does not prevent the British from employing them frequently, to the no small scandal of the superior orders. The Koonbees are pure Sudras, and adhere pretty rigorously to the Brahminical observances. They are divided into three tribes, and are much engaged in agriculture. The Vaneeyas, or Banyans as the British style them, also a Hindoo tribe, and numerously subdivided, are commonly merchants, and often travel into distant countries, where they reside for a considerable time; in consequence of which their native dialect becomes so extensively known as almost to form the mercantile language of Hindostan. Guzerat is one of the few countries in which are now to be found the Parsees, or fire-worshippers, the descendants of the once-illustrious race of the Magi. With the exception of those trades which require the operation of fire, there is no business in which this people do not occasionally occupy themselves; perhaps the greatest part of them, as of many of the other inhabitants, takes to the loom as a subsidiary method of obtaining a livelihood. Several of the larger towns in this province contain individuals of the singular body denominated Boras, who, while they resemble the Jews in many particulars, are Mahommedans as to religious faith, and whose origin and fortunes, could they be traced, would probably be found to involve an interesting relation to sacred history. The population of Guzerat may be fairly estimated at above six millions of souls; and perhaps no province in Hindostan shews greater variety of manners, customs, institutions, and sentiments. But it is likely that much of this will wear off as the influence of the British is extended over it.

So far as can be ascertained, the Coolies and Bheels, whose posterity still remains, were the first possessors of Guzerat. Afterwards the whole province seems to have formed one nation, which used the Guzerat tongue, but of which scarcely any thing else can now be accurately determined. Then followed the Rajpoots, of whom there appear to have been three dynasties; and from whom many of the Grassias are thought to be descended. The province was invaded in 1025 by Mahmood of Ghizni, and it was nominally dependent on the Patan sovereigns till the 15th century, when another Rajpoot family obtained the ascendancy in it. This again was overthrown in the reign of Acber. Subsequent to the death of Aurengzebe, the Mahrattas made their appearance in Guzerat, and sorely vexed it by their depredations. It was entirely broken off from the Mogul empire about 1724, and since that period has undergone, comparatively, little change of masters. It is now divided chiefly between the British and the Peshwa; but there are still some tracts on the coast which belong to native chiefs, partly independent, and partly tributary to the descendants of the Guicowar, whose power in this province is nearly of the same nature and almost of contemporaneous origin with that of the Peshwa both here and in the Deccan. The possessions of the British in it were scarcely capable of definition till 1817, when certain exchanges and arrangements were made which constituted a tolerably correct outline of a territory supposed to amount to about 11,000 square miles. The trade and commerce of this province are not now so extensive as they once were, especially during the flourishing state of the Mogul empire; but such parts as are under British government are understood to have recently improved in this respect. Its chief exports are grain, cotton, and cotton goods, which are carried principally to Bombay.

Guzerat, like other provinces, is subdivided into various districts, of which, and their capital, and most remarkable towns, it is now time to speak.

Puttunwar is in the north-west quarter, which is still rather imperfectly known. On the west of it lies the Runn, near which the country is sandy and parched. The people, who are mostly Coolies mixed with a small proportion of Rajpoots and Mahommedans, have the general character of being inveterate thieves.

Theraud, the chief town of a pergunnah of the same name, tributary to the rajah of Joudpoor, is thought by the natives to be a place of some strength, from its being surrounded by a wall and a ditch. It is not very large, is badly supplied with water, for which it is requisite to dig upwards of a hundred feet under the surface of the ground, and lies near to the territory of Sinde, whence predatory bands are used to issue, and to infest its neighbourhood.

Palhanpoor, 80 miles north by west from Ahmedabad, is a populous and fortified place, the position of which, on the borders of the desart that lies between Guzerat and Cutch, renders it of considerable political importance. It is subject to the Guicowar, in whose behalf the British, in 1813, sent a detachment in order to recover it from a Sindean faction, which surrendered it without resistance.

Rahdunpoor, the property of a nabob who acknowledges the superiority of the Guicowar, is a large populous town, without any important manufactures of its own, but a mart for the traders of Marwar and Cutch. It lies about three miles from the river Banass, and 125 north-west from Baroda, the Guicowar's capital. The nabob himself resides at *Sommee*, a tolerably large town, 15 miles south-east from Rahdunpoor.

The district of Kakreze, in the north-east of Guzerat, under a chief who recognizes the Guicowar, has for its capital an open town called *Therah* or *Turrah*, which lies half-way between Theraud and Rahdunpoor.

Jutwar, also in the north-east of this province, and chiefly inhabited by the tribe of Juts, who are of Sindean origin, is pretty well cultivated, notwithstanding the plundering and refractory habits of its natives. By some anomaly, not rightly explained, the female Juts have acquired extraordinary influence over the men, and are allowed, when they choose, to divorce their husbands. This privilege is not more extraordinary than the mode in which it is usually carried into effect. When a woman has resolved on getting rid of the matrimonial engagement, she collects together her female friends, attacks her husband, destroys his furniture, and so teases and persecutes him, that he finds it expedient to yield to her wishes by consenting to a divorce. She is then at liberty to take another partner.

Patree, a large and well inhabited town in this district, 44 miles south south-east from Rahdunpoor, was formerly reckoned among the chief cities in Guzerat.

Cattywar, or, as it is now more frequently denominated, the Guzerat peninsula, is at the south-western extremity of this province, having the gulf of Cutch and the Runn on the north, part of the Runn and the gulf of Cambay on the east, and the Indian ocean on the south and west. It is nearly 200 miles long in the direction of east and west, and upwards of 100 broad. Its chief rivers and streams are the Bhadur, the Muchoo, the Ajee, the Sutrinje, the Roopa Rete (silver waves), the Phooljer (studded with flowers), and the Nagne (serpentine.) It has few mountains, and these are of small elevation. The climate is on the whole dry and salubrious, though thick fogs prevail during the east and north-east winds, which blow in December and January. Much of the soil is sandy, and not very productive; but there are fine spots interspersed among the small hills, of a beautiful appearance and enviable richness. On the whole, wood is so scarce in this district as to give it a dull and dreary aspect. The inhabitants are of very various tribes, as Rajpoots of different families, and as connected with them the Bhatts; Catties, subdivided into three principal bodies, exclusive of the Charons; Coolies, to whom may be added Kauts and Sindees; and Koombees, with whom are associated the Mares, Aheers, Rehbaries, and some other people of minor note. The distinctions and peculiarities of these numerous diversities are scarcely of moment enough to deserve any specific notice. For many years before 1807, the whole of this extensive territory had been tributary to the Guicowar, though the revenue derived from it by him was both inconsiderable and very precarious. About that period the distresses and internal dissentions of the district, and which chiefly arose from the mode of levying the tribute, became so great and alarming as to require the interference of the British government. This at length proved effectual; but it was subsequently found necessary to propose a sort of exchange with the Guicowar, to which he consented. The management of the peninsula has accordingly devolved altogether on the British, to whom it may therefore be considered as tributary. Such a revolution is likely to effect a decided improvement in the moral and political condition of its formerly restless and unhappy inhabitants.

Few among the towns of the Guzerat peninsula deserve distinct enumeration. *Wudwan*, *Sylah*, *Wankaneer*, and *Mallia*, are fortified places, the last of which was taken by a British detachment in 1809. *Noanagur*, about seven miles south from the gulf of Cutch, is the capital of one of the most powerful chiefs in this part of the province. He is styled Jam, a word of uncertain signification, but denoting some honour, and exclusively applied to this individual. The present possessor of it, and of the territory called Noanagur, is in alliance with the British. *Kumbalia*, near the gulf of Cutch, is a good town that belongs to him, as does *Sutchana*, which lies to the east of his capital.

Okamundel, a maritime district, which begins at Kumbalia, is bleak and ill cultivated, inhabited chiefly by a Hindoo race called Wagheres, and is of some note in the sacred writings of this people. It was greatly infested by pirates and other robbers, till the British undertook the task of subduing or extirpating them. Through the interference of the same power, it was ultimately transferred to the Guicowar in 1817. *Dwaraca*, situated at the extremity of the peninsula, is both a populous and a sacred place. The latter character is derived from its having a celebrated temple, and being at one time the residence of Krishna. The small island called Bate Isle, at a short distance from it, has a good harbour, and possesses a tolerable town of the same name. The chief of Bate is reckoned a holy person, and profits materially by the offerings of the pilgrims who frequent Dwaraca.

The district of Burduda, on the south-west coast of the Guzerat peninsula, is a flat, moderately cultivated, and rather naked looking country. Its chief town is *Poorbunder*, 58 miles from Juggeth Point, a large, pretty well inhabited, and trading sea-port.

Junaghur, 60 miles N. N. W. from Diu Point, is the capital of Soreth, a district which has exhibited an amazing number of changes and public offences. It is now under British controul. To the east of Soreth lies the district of Babreeawar, which is mountainous and sterile, and of which *Jafferabad* may be reckoned the sea-port town.

Somnauth, a town noted for a temple in which there is a symbol of Siva, is nearly thirty miles N. W. from Diu Head.

Bhownuggur, a sea-port on the west side of the gulf of Cambay, is the chief mart for the trade between Cattywar, Ahmedabad, and Marwar. It is fortified. Its raja is now tributary to the British.

Arratum and Chowal are British districts, not very noticeable. Beejapoor, the capital of which is 40 miles north from Ahmedabad, also belonged to the same power till 1810, when it was exchanged, for more suitably lying territory, with the Guicowar.

Ederwara and Waugur, are districts also tributary to the Guicowar, but do not present any remarkable object.

Chumpaneer, the capital of a large subdivision of this province, is 22 miles north-east from Baroda. It was in early times the capital of a Hindoo principality, and seems to have been a large place. Its fortress is of respectable strength, but could not resist a small detachment of British in 1803, when Chumpaneer was captured from Sindia, to whom it was given up in the following year.

The district of Dubboi, an early conquest of the Mahommedans, who were succeeded in the possession by the Mahrattas, has a capital of the same name, which was at one time inhabited by 40,000 people, though now greatly declined, and is situated in lat. 22° 9′, long. 73° 25′.

Lunawara is a territory of no small importance, but only known to our countrymen within the last twenty years. Its capital of the same name has an extensive and pretty strong fort, and a tolerable trade. It is 63 miles east of Ahmedabad. In the war with Sindia, in 1803, this place served as a depot for the British army.

Soonth, 80 miles E. by N. from Ahmedabad, adjoins the territory of Lunawara, and has a well-built fort, though of itself it is a miserable place. The country round it is naturally very strong, and presents great difficulties to conquest.

The principality of Barreah, the capital of which, a neat town, lies 80 miles E.N.E. from Cambay, is chiefly remarkable as being one of the most independent states in Hindostan, though of small extent and influence.

Cambay, a very ancient place, and noted sea-port, at the upper part of the gulf of the same name, is fast going to decay; but it still contains several large and rather celebrated edifices, as mosques, temples, and tombs. The adjoining country is very productive; but the trade of the place has greatly diminished since Ahmedabad lost its consequence. The nabob of Cambay lays claim to independence; but it is probable that the Peshwa has really a right to the jurisdiction over it.

Kaira, a tolerably large town, 40 miles north of Cambay, is the capital of a large district, which now belongs to the British. The inhabitants were long considered an outrageous and difficultly managed people; but they are understood to be meliorating under their new masters. That race of men called Bhatts prevail here extensively; and have great influence over the superstitious Hindoos, chiefly by their peculiar hardihood of spirit in practising what is called *traga*. This signifies either a species of self-punishment, or the commission of a violent act, even to the amount of murder, on the persons of others, in order to induce certain individuals to comply with whatever is demanded,—the guilt of the deed being curiously enough imagined to devolve on those who refused the request. It is also sometimes had recourse to in the case of one of these people being insulted or any way injured. In fartherance of his object in this manner, a Bhatt has been known to sacrifice one or more of his nearest and dearest relatives, as a mother, a wife, or a daughter. An instance of the last sort occurred in 1808, under the government of the British. But it was taken up as murder by a court of justice; and since that period it does not appear that there has been any repetition of this monstrous offence. Gang-robbery, formerly very prevalent in this territory, is understood to have declined of late years.

Neriad, a town in this district, 28 miles N.N.E. from Cambay, was once a place of great trade, and about three miles in circumference. It has a good many villages attached to it in its tributary character.

Kuppurwunje, the capital of a pergunnah, ceded to the British in 1817 by the Guicowar, in exchange for Bejapoor, is a pretty well built town, occupied by about 10,000 inhabitants. It is 27 miles east from the ancient city, and still the Mahommedan capital of Guzerat, namely, *Ahmedabad*, which lies in lat. 23° 1′, long. 72° 42′. This was once among the largest places in Hindostan, its circumference having probably been about 30 miles; but it has greatly sunk in size and importance since the dissolution of the Mogul empire, though even in 1812 it was supposed to have had a population of 200,000. About the middle of the 18th century it was conquered by the Mahrattas, from whom it was taken in 1779 by the British, who restored it to the Peshwa in 1783, reserving merely the rights of the Guicowar. Subsequently there arose a dispute, respecting their claims to it, between these two chiefs, on which occasion the Bombay presidency interfered so far as to ascertain and determine their respective privileges.

Baroda, the capital of the Mahratta chief called the Guicowar, to whom allusion has recently been made, is in lat. 22° 21′, long. 73° 23′. It was a large town in the reign of Aurengzebe, and may be conjectured to have then been adorned by several public buildings of rather a grand appearance. It is still populous, containing about 100,000 inhabitants, and is a wealthy place; but the houses which have been erected by its present masters are far from being elegant. The country around it is well cultivated, and very fertile. The Viswamitra, one of the few and small rivers of Guzerat, runs by the city, near which it is crossed by a stone bridge. Little was known of the power of the Guicowar till far on in the last century, and its origin is within that period, in the intrigues of Pillajee Guicowar, at one time merely the proprietor of a village. He was succeeded in 1747 by his son Damajee, who was unable to withstand the Peshwa, then risen to high consequence, and to whom, besides ceding a large portion of his possessions, he was obliged to acknowledge himself tributary for the remainder. Damajee died in 1768, when the Peshwa contrived to have Futteh Singh appointed as his successor, who was followed by his brother Manajee in 1792. Then came Govind Row, on whose death, in 1800, there arose in his place the oldest legitimate son, Anund Row, who, being a man of weak parts, was circumvented by his brother Canojee. But this man, giving offence by the severity of his government, was deposed; and an attempt to reinstate him, made by Mulwar Row, cousin of the late Govind Row, was entirely defeated by the interference of the British, who espoused the cause of the legitimate sovereign. Since that time the influence of our countrymen has been sufficiently great to protect the Guicowar against the designs of the Peshwa, besides operating so as to improve the condition of his internal affairs, which have generally been a good deal embarassed.

Broach, a district bounded on the west by the gulf of Cambay, is described as one of the most cultivated and best peopled territories on the western side of Hindostan. Its excellence and convenient position made it long a desideratum with the Bombay presidency; but though given up to the British so early as 1782, its complete and secure possession, by a conquest from Dowlet Row Sindiah, was not accomplished till 1803, since which time it has greatly improved. *Broach*, the capital of it, seated on the north bank of the Nerbuddah, 25 miles from its entrance, and 221 from Bombay, is a dirty, humble-looking, but briskly trading town, and contains above 30,000 inhabitants. Ten miles from this place, and on an island formed by the Nerbuddah, stands the celebrated banyan tree, named Kuveer Bur, after a Hindoo saint, from whose toothpick it is popularly believed to have sprung. It was formerly a great deal larger, parts of it having been carried away by high floods; but it still retains such dimensions as may entitle it to the first rank among the magnificent productions of the vegetable world. Thus, comprehending its various stems, it is said to be 2000 feet in circumference; but is vastly larger if such of its branches as have not yet reached the ground and stricken root are also taken into account. Its chief trunks are enumerated at 350,—all of them of greater size than the usual run of English oaks; and its smaller stems, which are also of respectable bulk, have been reckoned at about 3000 in number. Each of these has its own branches, which point towards the earth, where, in course of time, they will take root and generate in their turn. According to the natives, it is 3000 years old, and will afford a shade for more than double that number of persons.

The pergunnah of Jumbosier, a highly cultivated and very fruitful territory, now tributary to the Bombay presidency, has for its capital, on the river also called Jumbosier, a town of the same name, which is probably about two miles in circumference, has a good trade with Bombay, and lies 26 miles north north-west from Broach. It is the birth place of Gangadhara, a Hindoo mathematician.

Oclaseer, five miles south from Broach, contains, with its pergunnah, about 30,000 people, of whom the Hindoos are by much the most numerous, the Mahommedans are next in amount, and the Parsees form but a very small proportion.

The pergunnah of Olpar, the capital of which is only seven miles north of Surat, is a valuable territory, which, after having fallen into the hands of the British, was given up as a particular favour to the Peshwa, by whom it was bestowed on one of his chief officers, whose manifest and obstinate hostility to the British at last provoked its resumption by a detachment from Bombay.

Zinnore, a town on the Nerbuddah, 26 miles east north-east of Broach, has several Hindoo temples reckoned of great sanctity, though going into decay, and contains about 10,000 inhabitants, many of whom are engaged in cotton-cloth manufactures. At about nine miles farther from Broach, in the same direction, and also on the same river, lies *Chandode*, a place of still greater sanctity, and which possesses temples of more splendour. One of these is described as rather an unusually elegant structure, though inferior to the religious edifices of Elephanta and Carli. The pilgrims who resort to Chandode do not fail to perform that never-to-be-forgotten expiatory operation, immersion. Most of the inhabitants are Brahmins.

The town of *Rajpepla*, 34 miles east from Broach, is the chief of a large, tolerably fertile, but miserably governed and sadly distracted district, that is tributary to the Guicowar. At about three miles east of *Neemoodra*, a village in this district, are the celebrated carnelian mines, in a wild-like and scarcely inhabited country. They are worked through numerous perpendicular shafts, few of which are more than 50 feet deep, and still fewer admit of being extended horizontally under the surface of the ground, which, from its infirm nature and the prevalence of heavy rains at certain seasons, would be exceedingly apt to fall in. The portions of carnelian found here weigh from a few ounces to two or three pounds, and are generally met with in distinct nodules lying at a little distance from each other. They are of various colours, but these are always changed by the process of burning, to which they are subjected. The merchants who come here for the carnelians usually take them to Cambay, where they are cut and polished for the market.

The British district of Surat, which consists of several tracts of country, obtained at different periods from native chiefs, and in particular the Peshwa and Guicowar, lies at the south-west extremity of Guzerat; is in general extremely well cultivated; and produces in abundance grain, cotton, hemp, tobacco, and a great variety of other vegetable substances. Though nominally all subject to the British government, various parts of this district still pertain to the two princes above mentioned; and such is the intermixture of their territories with the property of the Company, that it has often been found difficult to determine or preserve their respective boundaries, to regulate or collect the dues of government, or to maintain an effective police in the country. Owing to this cause, the jurisdiction of Surat is by no means a favourable example of a well regulated society, or free from some highly injurious improprieties and crimes. Gang-robbery is said to be prevalent in it; predatory visits, under pretence of raising seignorial dues, are frequently made, to the great annoyance of the well-disposed; and marine and river piracies are carried on to an immense extent. Altogether, then, it is extraordinary that the British government, whose influence in quelling disturbances and subduing refractoriness elsewhere, has proved so decisive, should not hitherto have fallen upon means sufficient to promote and secure its respectability and interests in this old and valuable segment of its dominions.

Surat, the capital of this district and of Guzerat, is planted on the south bank of the Tuptee, in lat. 21° 11′, long. 73° 7′, upwards of 1200 miles travelling distance from Calcutta, and 756 from Delhi. The outer wall by which it is surrounded is about 7 miles in circumference; and between it and the inner wall are many houses, villas, and cultivated fields. The town itself consists of dirty confined streets, and lofty but not agreeable houses, and possesses few public buildings which can be said to be either neat or elegant. Of the amount of its population no satisfactory statement has hitherto been given. It was at one time reckoned so high as 800,000, at another as no less than 600,000; the probability is, that even this last number is a good deal above the truth; but it is certain that this is one of the most populous cities in Hindostan. Surat has long been celebrated for its trade, though its vicinity to Bombay is not to its advantage in this respect. Moreover, its harbour is neither very commodious, nor quite safe in every wind; and large vessels are obliged to cast anchor at the distance of many miles from the town. One of the most singular institutions in this city is the Banyan hospital, where there are accommodations for sick and lamed animals of every description, and where, with extraordinary regard to living creatures, there used to be, if there be not now, a ward appointed for the residence and nourishment of the lowest and most disgusting vermin.

Surat is a very ancient city, being spoken of in the Ramayuna. It was early visited by Europeans, after the discovery of the maritime route to India, and became one of the chief marts for trade with the eastern countries. The English established a factory in it in the commencement of the 17th century; and they were soon followed by the Dutch, to whom, at some distance of time, followed the French, who, after carrying on an unprofitable commerce with it for a short period, abandoned it, leaving their debts unpaid. It was several times visited hostilely by the Mahrattas, between the middle of the 17th and the end of the 18th centuries; nor was it entirely freed from their rigorous claims till 1803, since the treaty of which year it has remained exclusively under and been governed by the Bombay presidency. But from what was formerly said, it will readily be inferred, that the police of Surat is still imperfectly administered; and it must be owned, that though so large a place cannot be easily preserved from outrages and misdemeanours, the number of offences committed in it is not very creditable to the existing authorities.

Within a short distance from Surat lies the independent estate of Sacheen, the chief of which, when applied to for the purpose a few years ago, refused to allow the British government to interfere in the administration of the police and criminal jurisdiction within his territories.

Damaun, a good sea-port in Guzerat, at the distance of 100 miles north from Bombay, was early taken possession of by the Portuguese, to whom it still belongs. It is noted for ship-building, and is a neat good-looking town; but its trade has greatly declined of late years.

13. *Malwah* is bounded on the north by Ajmeer and Agra, on the west by Ajmeer and Guzerat, on the south by Khandesh and Berar, and on the east by Allahabad and Gundwana. It is an elevated country, and as such contains the sources of several rivers which water some of the adjoining provinces, but none of which attains to any great magnitude till it has passed its borders. Those of most consequence in Malwah, whether arising in it or flowing through it, are the Nerbuddah, Chumbul, Mahy, Betwa, Sinde, Sepra, Cane, and Parbutty. But though among the most lofty regions in Hindostan, and surpassing in height the neighbouring districts,

Malwah surpasses most of them in fertility and the quality of productions. The soil is generally a fine vegetable mould, capable of most beneficial cultivation; and, besides excellent pasturage for cattle, yields abundant crops of grain, cotton, tobacco, indigo, opium, and several kinds of fruit. Its tobacco is reckoned the best in Hindostan. The nature of the country is not suitable for rice, which, accordingly, is grown in it very sparingly. Here, as in other parts of Hindostan, there are two harvests, one in September and October, and the other in March and April.

Malwah seems to have been an early Hindoo state, and to have arrived at some consequence before the 13th century, when it was subdued by and became tributary to the Patans of Delhi, who held rather an uncertain dominion over it for some time. It was afterwards governed by independent princes of the Afghan family, who gave place to the Moguls, of whose empire it formed a province till the death of Aurengzebe, after which it was overrun by the Mahrattas, to whom it has been more or less subject ever since 1732. But some of the descendants of the ancient proprietors still remain in this province, and, under the name of Grassias, contrive, by various means, to maintain a sort of forced and uncomfortable independence in it. Part of the interior of Malwah towards the south is inhabited by the Bheels, a semi-barbarous tribe, supposed by some to be the remains of the original inhabitants of this province. They are Hindoos, but do not pay much regard to the peculiarities of their religion; and are, on the whole, far more inclined to live at large, by thieving and hunting, than accustomed to the regularities and restraints of social life. The Coolies are also to be met with here, and, with some minor distinctions, exhibit several traits of resemblance to these people. But wild and predatory in their habits as the Bheels long were, and advancing, through the weakness or timidity of those who suffered from them, to a degree of consequence as a state, which could not well have been expected to arise from their rudeness and very imperfect civilization, they have shewn susceptibility to kindness, and a considerable sense of gratitude and honourable feeling, in return for the confidence placed in them by our countryman Sir John Malcolm, who was recently employed to re-establish tranquillity in this part of Hindostan,—thus affording another example of the efficacy of conciliatory treatment, where, at the same time, there is possessed and manifested, on the part of the benefactor, an amount of power that would utterly belie any supposition of fear being the motive which induced it. The events now alluded to are either connected with, or subsequent to those operations against Holcar, Sindia, and the Pindarees, which for some time occupied the attention and roused the vengeance of the British government, but which it is not thought worth while to detail in this place. Only of the latter, with whom there was so much trouble, and for whose extirpation from Malwah such vigorous measures were found necessary, it is proper to say a few words.

The Pindarees, though mostly Mahommedans, were made up of all sorts of persons, who preferred the lives of plunderers to the peaceful occupations of agriculture and commerce, or whose crimes and forfeiture of character among other people made them associate with the desperate of the Mahratta and other predatory tribes. At one time they occupied only some of the skirts and a small portion of the province; but, in course of time, they extended their visitations, and gave alarm to almost every quarter of it. Generally speaking, they lived in small bands, each under its own chief; and these kept asunder for the greater convenience of plundering in detail, though always ready to unite in large parties, or even to form one body, when a suitable object presented itself to their cupidinous or vindictive desires. In these cases, the individual who acted as their commander had commonly no other claims on the obedience of his ruffian companions than what were derived from his known or supposed personal qualities for the office, or the experience which he had had in similar enterprises. To him was usually given the title of Lubbrea; and when actually engaged in an enemy's country, or exposed to great danger, the authority of this "bad eminence" was as absolute as the sense of superiority on the one side, and the hope of advantage arising from implicit subjection to one ruling mind on the other, could make it. The minutiæ of their organization as a horde of robbers rather marked their aptitude for midnight marauding, than enabled them with any chance of success to take the field as combatants against a regular army; but still there was something not a little formidable, even to well disciplined troops, in their numbers, the facility with which these could be augmented, the secrecy and versatility of their vexatious attacks, their artifices to deceive and embarass their opponents, and the certainty, that though severely or frequently chastised, there would still remain in them the readily excitable disposition to repeat their annoyances and avenge their misfortunes. Nor were they altogether ignorant of those more scientific, or at least more orderly principles of the military art, which their occasional services in the armies of the Peshwa previous to 1794 had furnished them with opportunities to appreciate and to learn, so far as attachment to early prejudices and convenient habits would allow them. From that period till 1806, their importance was rapidly on the increase; and in this last year one of their chiefs was actually in possession of eleven pergunnahs, either the gift of his allies, or the acquisition of his own arms. But he then, if not earlier, incurred the enmity of Sindia, by whom he was deceitfully made prisoner, and confined at Gualior for five years. During this period some of the other Pindaree chiefs became of more consequence than they had previously been; and at the end of it, in 1811, Kurreem Khan, for so the captive was named, purchased his freedom, and, uniting his forces with theirs to a large amount, proposed an attack on Nagpoor, the capital of the Mahratta raja. In this it is probable he might have succeeded, had not one of his associates deserted him and become an antagonist. He was defeated by Sindia, and forced to seek refuge with Ameer Khan, by whom he was again deprived of liberty for about five years. Still there remained so many of his troops as, when added to those of the other chiefs, all under the command of Cheetoo, the individual who had abandoned him, amounted to upwards of 30,000. Such a formidable body, accustomed as they were to the worst vice of a barbarous soldiery, could not fail to attract the attention, and rouse the vigilance of the British, whose territories were necessarily not a little exposed to their inroads and excesses. Corresponding preparations were needed decisively to oppose them; and it soon became apparent that nothing short of the most enervating chastisement, if not total extirpation, was demanded by their audacity, their present capabilities, and eventual influence. Such, then, was the task which the Marquis of Hastings found himself compelled to undertake in October 1817, and which, by indefatigable exertions, the most judicious combinations and arrangements, he accomplished effectually in the following month, by the entire dispersion or destruction of these restless freebooters. Such of them as submitted were mildly treated, and provided for by small allotments of lands, the cultivation of which it is anxiously to be wished may supersede their former practices.

There are not many districts or towns in Malwah of which it is necessary to speak particularly.

Chanderee, in the north-west extremity, is large, mountainous, well watered, and very fertile. Its chief towns are, *Seronge*, once a prosperous and still a considerable place, with a manufacture of coarse cloths, and formerly a possession of Holcar's, but now belonging to Ameer Khan, situated about 850 miles from Calcutta, and 253 from Agra; *Chanderee*, an ancient but decaying town, 48 miles north north-east from Seronge; and *Khemlasa*, a walled town with a fort, 37 miles east by north from Seronge.

Mundessor is the name of a large district in the west of this province, and has for its capital, among other towns, a place so called, which has tolerable good walls and a fort, 80 miles north-west from Oodjein, presently to be mentioned. Near a village called *Maheidpoor*, 24 miles north from Oodjein, was fought, on the 17th December 1817, the desperate and decisive battle between the army of Holcar, commanded by Ghuffoor Khan, and the British troops under Sir Thomas Hislop, in which the former were entirely defeated and lost all their artillery, amounting to 63 pieces, with several elephants, and a great number of camels. But this victory was dearly purchased, as, from the determined spirit of the enemy, and the excellent manner in which their guns were managed, our countrymen lost 174 killed, three of whom were officers, and 604 wounded, 35 of whom were officers.

The district of Oodjein, in the south-east extremity of Malwah, is on the whole well watered and abundantly productive. Its town of the same name, distant about 1000 miles from Calcutta, and 440 from Delhi, is the capital of the Sindia Mahrattas, and is chiefly inhabited by the official personages of their government. It is about six miles in circumference, but has, on the whole, a mean appearance, and, with the exception of four mosques erected by individuals, and several Hindoo temples, possesses few remarkable buildings. The Sipra or Sopra river washes the south wall of this city; and within a mile's distance, to the northward, are still to be found, on digging, the ruins of the very ancient town of the same name, said to have been destroyed by an earthquake. This is the place spoken of in some of the classical geographers under the name of Ozene. The territories of Sindia have been materially curtailed in consequence of his own imprudence in offending and provoking the British government; and so greatly has his authority declined, even within his own dominions, that he seems to require the aid of that very power in order to preserve proper respect among his subjects, and restrain the mutinous dispositions of the soldiery, whom his distresses and mismanagement forced him to disband without payment of all that was due to them. Such, accordingly, is his reduced and enfeebled condition that, without British interference, it is almost impossible he can remain much longer an independent prince.

Indore, the capital of the Holcar family, though not much visited or resided in by them, lies at a short distance from Oodjein, in latitude 22° 43′, longitude 75° 48′. It is neither very large nor very populous, and is so weakly defended that it forms a ready prey to any respectable army that chooses to attack it. The rise of the Holcar family is quite recent, Mulhar Row Holcar, who laid the foundation of its power, being contemporary with the first Peshwa, under whom he attained to some consequence; but its chief elevation and importance must be ascribed to Jeswunt Row Holcar, an illegitimate son, between whom and Dowlet Sindia there took place a long and obstinate and varied contest for superiority, which in the issue involved the interests of the British government so much as to require the vigorous services of general Wellesley. Holcar, reduced and dispirited, remained quiet during the succeeding war of 1803, between the British and Sindia; but soon after its conclusion, he reverted to his former evil practices, as a sort of public robber and predatory chief, and by these, as well as by the murder of three British officers, brought on a war, which, after several routs and discomfitures, terminated in 1805 by his sueing for peace. The arrangements then made with him were far more liberal than he could reasonably have expected; and with proper guidance and considerate conduct, Jeswunt Row Holcar might have remained a highly respectable independent prince. But, soon after the treaty, he became afflicted with mental derangement, the consequence of which, and of a serious insurrection within his dominions, as well as of other circumstances, was the rapid deterioration of his affairs previous to his death in 1811. During the minority of his son, Mulhar Row Holcar, the administration of this state was chiefly entrusted, as it had been during the incapacity of the late chief, to his wife, Toolsie Bhye, the mother of the prince his successor. This lady appears to have been well disposed, on the whole, towards the British, and more than once manifested a resolution to confide in them in certain emergencies of her government, and more especially in the necessity that arose for chastizing the Pindarees and other predatory hordes. But on the very eve of completing an arrangement to this effect, and apparently in opposition to her wishes, a sudden revolution took place among the subordinate chiefs to assist the Peshwa in opposing the British. All negociations for peace with the leaders of young Holcar's army having failed, and being probably construed as indications of weakness, hostilities commenced, and almost as immediately ended, in the battle of Maheidpoor, already spoken of as totally destructive of the enemy, though at the same time severe to our countrymen. The treaty now entered into with Mulhar Row Holcar, for his mother had been publicly put to death the evening before that decisive engagement, farther reduced his already decayed power, and so much dismembered his dominions, though it left him a very comfortable and fertile property, that no great danger need in future be apprehended either from this prince, who is still a youth, or his tributary but rebellious chiefs.

Of the other states or presiding towns in Malwah, such as Jabooah, Amjerah, Dhar, Ally Mohun, Mundoo, Shujawulpoor, Raisseen, Bo-paul, Islamnagur, Dhamonee, and Saugor, it is thought sufficient to say, that theirinhabitants are either so grateful for benefits received from the British, or so thoroughly sensible of their superiority, that their relation to the general concerns of the province promises the continuance of its peace and the advancement of its best interests.

DECCAN.—The Deccan forms the third great division of Hindostan. The word signifies *South*, and, according to the Hindoo geographers, it included the whole of those countries which lie to the south of the river Nerbuddah; but it is now limited to the districts included between that river and the river Krishna, corresponding to the territories held for several centuries by the Mahommedans after their invasion of the Deccan. Of this extensive region the chief part of the population is Hindoo; but a considerable portion is Mahommedan, among which the manners and customs of the Hindoos prevail. The towns and principal villages are well supplied with European goods of all kinds, by a race of men who purchase them at Bombay, and retail them throughout the country. The modern division of the Deccan, as already specified, is into nine provinces.

1. *Gundwana* lies between the 19th and 25th degrees of north latitude; has for its boundaries on the north and west Allahabad, Bahar, Malwah, and Berar; and on the south and east Orissa, the river Godavery, Bengal, and Bahar; and is about 400 miles in length, with an average breadth of 240 miles. A large proportion of the province is mountainous, ill watered, covered with jungle, and thinly inhabited by a miserable native race called Goands, who were driven by the Mahommedan invaders to the interior districts, which are represented as a continued wilderness of elevated country, from which the famished and uncivilized natives frequently make excursions to plunder the harvest of the more fertile tracts in the low lands. The Goands are Hindoos of the Brahminical sect; but, excepting the flesh of the ox, cow, and bull, they do not abstain from animal food. It seems probable that their necessities may have compelled them to this relaxation from the more rigid Hindoo practice.

Nagpoor is the chief town of the province, and the capital of the Eastern Mahrattas, stands on a fine high and fertile plain, but is of modern date, meanly built, with narrow streets, and houses covered with tiles. The population of the town and suburbs is estimated at 80,000; and the distance from Calcutta is 733 miles, and from Bombay 577 miles.

Ruttunpoor, signifying *Diamond town*, is the capital of the fertile and extensive district of Choteesgur, is 220 miles from Nagpoor, and consists of about 1000 huts built in a straggling manner. Near the town is a gigantic idol of granite, nine feet in height, painted red, and adorned with flowers; in the vicinity are pools and tanks; and many ruins indicate its former prosperity. In 1760, Ruttunpoor was the scene of a treacherous barbarity, when Mr Law was made prisoner, and 120 French who had been under his command, in endeavouring to effect a retreat from Bahar into the Deccan, were at first entertained by the Mahratta sovereign, and then cruelly murdered in cold blood.

Ryepoor, in the same district, is 69 miles south from Ruttunpoor, consists of 3000 huts, is surrounded with decayed walls and a deep and wide ditch, and enjoys some commerce. The soil in the neighbourhood is of a rich black mould.

Sumbhulpoor is the capital of a district of the same name, and stands on the east side of the river Mahanuddy. The mountains of this district afford diamonds, which are found in a loose soil, chiefly composed of a red clay.

Mundah, *Gurrah*, *Bustar*, and some other towns and villages, are also included in the province of Gundwana.

2. *Orissa*, another large province of the Deccan, extends from the 16th to the 23d degree of north latitude, is bounded on the north and west by Bengal and Gundwana, and on the south and east by the river Godavery and the bay of Bengal. The length is estimated at 400 miles, and the average breadth is about 70 miles. The interior of this province presents a very rugged aspect; the deep water courses, pathless deserts, uninhabited jungles, and impenetrable forests, form a strong natural barrier to the maritime districts; for in the whole extent of the mountainous ridge, only two passes have been explored. The climate of these unfertile tracts is extremely unwholesome. One half of the province of Orissa, comprehending the low lands along the coast, consists of a fertile plain, but thinly inhabited and ill cultivated, and is under the jurisdiction of the British government; and the other half, which is wild and barren, is held by tributary zemindars or hill chiefs. Rice and salt are the principal productions of the British portion. In the mountainous regions, the natives seem to have made some progress in the arts; for they smelt iron, fell timber, and build boats.

The pergunnahs of Tolchan and Hindole furnish the best bamboos for palanquins. They grow near the summit of the rocks; the strongest shoots are selected and secured to stakes driven into the ground, by which the proper shape is obtained; and when the dry season approaches they are cut down.

Hurricanes are frequent in the low lands, which are also subject to destructive inundations of the rivers. Tigers, jackals, hogs, and deer are abundant in the flat country; the high lands are infested with wild beasts, which threaten by their increasing numbers to wrest from man their ancient domain; and the rivers swarm with fish and alligators. Besides innumerable mountain streams, the Godavery, Mahanuddy, and Subunreeka, are the chief rivers; and, among the places more worthy of notice, may be mentioned Cuttack, Juggernauth, and Balasore.

Cuttack, is a town in a district of the same name, and is built on a neck of land washed by the Mahanuddy and Gunjoory rivers, the former of which is two miles broad in the rainy season. The town stands in a flat country, which, during the inundations, is under water for a circuit of ten miles. The population, which has been stated at 100,000, is supposed to be greatly over-rated.

The district of Cuttack is about 180 miles in length, and 110 miles in breadth. On the sea coast it is covered with wood, and inundated by the sea at spring tides; but 20 miles in the interior the country rises considerably, and has a dry fertile soil, and 20 miles farther inland swells into hills which produce much valuable wood.

Balasore is a town and factory in a flat country, about 125 miles south-west from Calcutta, stands on the south side of a deep and narrow river, with marshy banks; was formerly a flourishing place for the manufacture of a particular kind of cloth, which has now declined, and had also a good deal of commercial intercourse. The native vessels of this place are still employed in transporting grain from Bengal to Madras. Pilots for ships destined for Calcutta are procured in Balasore roads.

Juggernauth is the most celebrated of all the religious establishments of the Hindoos. It is situated on the sea coast of this province, 47 miles from Cuttack, and in the district of the same name. Ten miles round this sacred place, on the land side, is called the Holy Land of Juggernauth; and the Hindoo who dies within these limits is assured of future happiness. The temple or pagoda, which is the residence of the idol, is one mile and a half from the shore, and consists of an irregular mass of decayed granite; and the town of Pooree, which is ill built, large, and dirty, is chiefly inhabited by the officiating priests and officers attached to the temple. The history of this idol is involved in eastern fable. The image which is now exhibited is a carved block of wood, having a frightful visage painted black, a distended mouth of a bloody colour, large head and eyes, without legs, and with only parts of arms, excepting on great ceremonies, when he is supplied with gold or silver arms. Two other idols, called the brother and sister, are of a white and yellow colour, and each has a distinct place in the temple. The ruth or car on which the idol is placed when he is exhibited to the people is 60 feet high, and is supported by strong frames placed on four or five rows of wheels; and he is accompanied by his brother and sister, who sit on thrones nearly of the same height. The upper parts of the car are covered with English broad cloth, and is striped red and white, blue and yellow, and decorated with streamers and other ornaments. At the time of celebrating the ruth jattra, which varies from the middle of June to the middle of July, the images are brought forth with great ceremony, and the immense machine is dragged along, amidst the shouts of a prodigious multitude, to the idol's country residence, only one mile and a half distant, but with so slow a motion and with so many interruptions, that it requires three or four days. Scenes of dreadful horror present themselves during this exhibition, either from accidents among so crowded a mass of living beings, or from the self-devotion of the victims who throw themselves under the wheels of the car and are crushed to pieces, while superstition appears in its most repulsive and disgusting forms.

Thirteen annual festivals are celebrated at Juggernauth, and, during their celebration, religious mendicants and devotees of all descriptions exercise the most indefatigable industry and preposterous ingenuity in exciting the charity of the multitude. The Hindoos who undertake the pilgrimage to Juggernauth, endeavour to arrive at four particular times, when the swinging, the sweet-scented, the bathing, and the car festivals take place. But the greater number of devotees prefer the swinging and car festivals, which are therefore most frequented.

Having performed the preliminary ceremonies and paid the fees, the pilgrim approaches the temple and is favoured with a look of the idol; and having bathed in the sea, he returns to the temple, purchases some of the rice which had been recently offered to Juggernauth, and with this rice performs the obsequies of his deceased ancestors. During his stay he attends the daily solemnities, makes offerings of rice and other things to the idol through the priests, and from them receives for payment a supply of ready-dressed food, which is reckoned peculiarly nutritious, because it is first presented to Juggernauth. Pilgrims also, who can afford it, entertain the Brahmins, and, with a remarkable exception to their religious principles and practices, eat at this time with every description of devotees and of every caste.

An immense concourse of pilgrims annually flock to the temple of Juggernauth, and even at the distance of 50 miles the human bones scattered on the ground mark its approach; for in consequence of the hardships and privations to which they are exposed, great numbers fall victims to this enthusiastic pilgrimage, and indeed it is regarded as peculiarly meritorious to die within the limits of the holy ground of Juggernauth. It has been estimated that not fewer than 1,200,000 persons visit the temple annually, of whom a great number never returns.

For the purpose of preventing persons from approaching the temple without paying the tax for admission, a strong barrier of prickly bamboos is erected, and a guard of soldiers is placed at the gates of the barrier. Many classes of persons are exempted from this tax, such as professed devotees or mendicants; those who are born within the limits of the holy land, or who have resided within these limits for ten years; those who carry a portion of the water of the Ganges to the temple, and pour it over the idol; those who are in a state of poverty; and the British sepoys of the Hindoo persuasion.

Of the different classes who are subjected to the tax, some pay ten rupees and others six rupees, and have the privilege of access to the temple for 30 days; persons of another class pay five and three rupees, with access for ten days; those of a third class pay two rupees, with access for four days; and to the fourth class belong persons of low caste who pay two rupees, but have the privilege only of performing the usual ceremonies on the outside of the temple, which they are not allowed to enter, for 16 days.

In the year 1803, when this part of India fell under the British government, possession was taken of the town and temple, to which the consent of the idol was previously obtained through the officiating priest. In 1815 the gross receipts of the temple arising from the tax on pilgrims, from lands, and other sources, amounted to 86,027 rupees, and the expences to 74,880 rupees. The superintendance of the temple, and the controul of the priests and servants of the establishment, are vested in the raja of Khoordah, a privilege which had long remained in that family, and is continued under the authority of the British government.

For the purpose of improving the road from Bengal to Juggernauth, a rich Hindoo inhabitant of Calcutta offered to contribute a lack and a half of rupees, equal to about L.16,000, on condition that the road, when completed, should be called by his name. This road was begun in 1813; and although the merit of the pilgrimage, by diminishing the difficulties and sufferings of those who undertake it, is greatly diminished, yet its advantages to the country, in facilitating communication, are great.

Khoordahghur is the residence of the Khoordah raja, who is alluded to above as hereditary high priest of Juggernauth, and keeper of the idol's wardrobe. This place is situated in an impervious forest, the trees of which are carefully trained to grow in a close matting of the most thorny thickets, to prevent all access, except by avenues which are strongly fortified. In consequence of the disturbances in this district, it was necessary, in 1804, to secure the person of the raja, which was accomplished with some difficulty.

3. *Northern Circars*, is a large province which extends along the west side of the bay of Bengal, from the 15th to the 20th degree of north latitude. Bounded by the sea on the east, it stretches 470 miles from the southern extremity to the northern limit, on the borders of the Chilka lake; and to the west and north a mountainous ridge divides it from Hyderabad and Berar. The superficial extent of this province is estimated at 17000 square miles. The climate in many parts is extremely hot; the parching winds sweeping over stagnant salt marshes at certain seasons of the year, are exceedingly destructive to vegetation; and the hill fever, ascribed to the noxious state of the air, is very prevalent in some districts. The sea-coast of part of the province is mountainous, and in another flat and sandy.

The inhabitants, exclusive of a few thousands of Mahommedans dispersed in the towns, are wholly of the Hindoo race, and are estimated at two and a half millions. The political constitution of a village or township will be understood from the following description of its officers and servants, and their appropriate duties. The first is the *potail*, or head inhabitant, who is the superintendant of police, and collects the revenue; the *tallia* detects crimes and offences, and protects travellers; the *totie* guards and assists in measuring the crops; the boundary-man preserves the limits of the village lands; the superintendant of tanks distributes the water for the purpose of agriculture; the Brahmin performs the duties of religion; the schoolmaster instructs the children to read and write, by drawing characters in the sand; the calendar Brahmin, or the astrologer, is consulted concerning the proper times of sowing and threshing; the smith and carpenter, the potman or potter, the washerman, the barber, the doctor, the musician, the poet, and the dancing girl, exercise their peculiar trades and professions.

A good deal of muslin is manufactured in this province, as well as some carpets and silk stuffs. The exports to Europe are chiefly the finer kinds of cotton goods, and the coasting trade is considerable.

For the permanent settlement of the territorial revenue of the Northern Circars the province was divided in 1802 and 1804 into five regular jurisdictions, namely, Ganjam, Vezagapatam, Rajamundry, Masulipatam, and Guntoor.

Ganjam occupies the northernmost portion of the five Circars, has a very extensive line of sea coast, with the bay of Bengal on the east, and part of the Orissa province on the west. The interior of the district is hilly, but near the shore are large and fertile plains. Ganjam, the capital of the district, stands on the sea coast, and, with some of the other towns, enjoys a considerable coasting trade.

Vezagapatam, the second district or subdivision of the Northern Circars, lies to the south of Ganjam, to which it is exactly analagous in its climate and productions. Vezagapatam is the chief town of the district, from which are exported wax, salt, rice, and indigo; and spiceries, wine, cocoa-nuts, and cowries are imported.

Rajamundry, the third district, lies to the southward of Vezagapatam, and includes a space of 1700 square miles. The sugar-cane is extensively cultivated in some parts of this district, and the forests along the banks of the Godavery produce abundance of teak trees. The capital of the district, which has the same name, stands on the east side of the Godavery, about 50 miles from its mouth, and the river at this place is about a mile in breadth.

Masulipatam lies to the southward of Rajamundry, and comprehends within its limits a great proportion of the ancient Circars of Ellore and Condapilly. The capital of the district of the same name is a sea-port town; has long enjoyed an extensive foreign commerce, and can admit vessels of 200 tons burthen into its harbour.

Guntoor, the fifth district, lies to the south of Masulipatam, and originally comprehended an area of 2500 square miles. The soil in some places of this district is impregnated with saltpetre; and many spots are favourable for the production of grain, but during severe droughts every kind of vegetable is parched up. The diamond mines of this district have long ceased to be productive.

In the month of March 1816, the district of Guntoor suffered dreadful ravages during a predatory incursion of the Pindarees. This inroad into the British territories lasted eleven days, during which time they plundered 339 villages, killed or caused to destroy themselves 182 persons, and wounded and tortured with every species of cruelty more than 3000.

Guntoor, the chief town of the district, which is 48 miles west from Masulipatam, was attacked by the Pindarees during their incursion, and was pillaged for several hours.

4. *Khandesh*, the fourth province of the Deccan, is chiefly situated between the 20° and 22° of north latitude, is separated on the north from Malwah by the river Nerbudda, and has for its boundaries on the west Guzerat, and on the south and east Aurungabad and Gundwana; is estimated at 210 miles in length, with an average breadth of 80 miles; was originally one of the Mahratta provinces, and is remarkable for the natural strength of its military positions. The ridge of the Western Ghauts extends along the river Tuptee, from whence are passes to the lower countries. This province presents an irregular surface, although it is not mountainous; and in the close vallies the climate is hot and sultry. The inhabitants of this territory are supposed not to exceed two millions, and are chiefly Hindoos of the Brahminical persuasion. It was formerly more populous and flourishing; but from the inroads of predatory tribes, and the oppression of Mahratta governors, many towns are in ruins, numerous villages destroyed, and a fertile and well watered soil is overgrown with jungle. A large proportion of this province was held by the Holcar family, the whole of whose dominions was ceded in 1818 to the British. The principal towns are, Boorhanpoor, Aseerghur, Hindia, Nundoorbar, and Gaulna. Boorhanpoor, the ancient capital of the province, stands on the north-west bank of the Tuptee, is an extensive city, occupying a fine plain, and surrounded by a wall. In the days of its prosperity it extended ten miles, of which abundant proof is obtained from the heaps of ruins scattered in all directions. The remains of a celebrated garden, called Laul Baugh, cover a space of two miles in extent.

5. *Berar*, lies between the 19° and 21° of north latitude, and has for its boundaries on the north and east Khandesh, Mulwah, and Gundwana, and on the south and west Aurungabad and Beeder; is centrally situated between the bay of Bengal and the western coast of India, and may be considered as an elevated valley, accessible by a chain of mountain passes. Wheat, Indian corn, peas, vetches, and flax, are cultivated in this province. The trade is conducted by itinerant inland carriers; and at an annual fair held in the mountains, between the Tuptee and Nerbudda rivers, a good deal of business is transacted. During this fair, eight or ten victims of a singular superstition throw themselves from a precipice, in consequence of a vow made for boons solicited and obtained from idols. This province has been often subjected to the ravages of predatory tribes. The principal towns are Ellichpoor, the capital of the province, Ajuntee, and Mulcapoor.

6. *Beeder.*—The province of Beeder is chiefly situated between the 17° and 20° of north latitude, and is at present comprehended in the dominions subject to the Nizam; has for its limits on the north and west Aurungabad, Berar, and Bejapoor, and on the south and east Hyderabad and Gundwana; presents a surface which is uneven and hilly, but not mountainous, and is traversed by numerous small rivers. The country is generally productive, and formerly contained a redundant population, composed chiefly of Hindoos, although long under Mahommedan sovereigns. The chief towns are Beeder, the capital, which is surrounded with a wall of six miles in circumference, Calberga, Nandere, and Calliany.

7. *Hyderabad* is a large province between the 16° and 19° of north latitude, is estimated at 200 miles in length, with an average breadth of more than 100 miles, and communicates its name to the Nizam's dominions collectively. The surface is an elevated table-land, hilly but not mountainous, and the climate is often so cold as to require the inhabitants to protect themselves with woollen blankets, shawls, and quilted silks; and among some of the higher ranks English broad cloth is in requisition as a fashion or luxury. Many of the districts of this province are rich and fertile, and in some places wheat is cultivated. The chief trade carried on between the Nizam's dominions and the British territories is the supply of cotton sent from Berar to the Northern Circars, and to Vellore, Arnee, and the vicinity. Salt and salted fish, cloths, and Arnee muslins, are received in return.

Hyderabad, the capital of the province, stands on the south side of the river Musa, a rapid stream during the rainy season. The city is surrounded by a wall which only affords protection against the incursions of cavalry. The length of the city within the wall is about four miles, and the breadth about three miles; the streets are crooked, narrow, and ill paved; and the houses, chiefly of one story, are constructed of wood. The palace and mosques, of which latter the number is considerable in consequence of Hyderabad having been long an important Mahommedan station, are the chief buildings; and six miles to the westward is the celebrated fortress of Golconda, on the summit of a conical hill. The population is estimated at 200,000. The surrounding territory presents a sterile and rugged aspect, but vegetables and grapes grow to considerable perfection. An immense tank or reservoir, covering 10,000 acres, and measuring nearly 17 miles in circumference, was formed in the neighbourhood of Hyderabad, and completed in 1812. This reservoir, which is filled by a canal cut from the river, is intended to supply the city with water, and to irrigate an extensive tract of waste land.

Hyderabad is one of the few remaining Mogul governments in which much of the old forms and ceremonies is retained at the court of the Nizam; and no small difficulty has been experienced in keeping up the influence of the British government against the intrigues, profligacy, and corruption which prevail among those by whom a weak and effeminate sovereign is surrounded.

Golconda is an extensive district of this province, and was formerly celebrated for its diamond mines, although it is alleged no diamonds were ever discovered in that territory, but that they are brought from other parts of India to be polished and prepared for sale by the diamond merchants of Golconda. The fortress of Golconda, already noticed, was once the capital of an extensive kingdom under the native Hindoo princes. It is now chiefly used as a state prison for the confinement of the obnoxious members of the Nizam's family, and as a place of security for the principal inhabitants and bankers of Hyderabad, to which they retire with their money on occasion of alarm.

8. *Aurungabad*, signifying the place of the throne, is a large province, chiefly included between the 18th and 21st degree of north latitude, has for its boundaries on the north and west the provinces of Gujerat, Khandesh, Berar, and the Indian ocean, and on the south and east Bejapoor, Beeder, and Hyderabad. The surface of this province is very irregular and mountainous; it abounds with natural fortresses and strong-holds; and several rivers have their sources within the limits of this province. The soil is in many places fertile, and affords a superabundance of grain for exportation. Rice is chiefly cultivated, and horses of a hardy breed are reared in great numbers for the Mahratta cavalry. The population has been conjectured not to exceed six millions, of whom not more than one-twentieth part belongs to the Mahommedan persuasion; various provincial dialects prevail, but the Mahratta language is chiefly used. Till of late years three-fourths of the province were subject to the Peshwa, and the remainder to the Nizam, with the exception of the islands of Bombay, Salsette, and a few other districts on the main land. The predatory habits of the Mahrattas, which extended even to piratical excursions on the ocean, have been greatly checked by the interference of British power.

Aurungabad, the capital of the province, was originally named Gurka, but having become the favourite residence of Aurengzebe, received its present appellation. It is within the Nizam's territories, is surrounded with low walls furnished with round towers, and in its interior exhibits the appearance of a deserted capital, half-peopled, and in ruins. The population is still said to be considerable; and various kinds of commodities, European and Indian, are exposed for sale in an extensive market-place.

Ahmednuggur, a city and fortress which was many years the capital of an independent state, but fell under the Mahratta power at the beginning of the 18th century, was ceded to the British in 1803, with the view of being ultimately restored to the Peshwa. The fort is built of stone, is about a mile in circumference, with numerous round towers, and is surrounded with a deep and broad ditch.

Dowletabad is a town and strong fortress seven miles north-west from the city of Aurungabad. The fortress is formed of an insulated mass of granite, which rises to the height of 500 feet, with a sharp-pointed summit. The access and passages to this strong-hold are perhaps the most singular of any fortified place in the world; an outer wall of no strength surrounds the fortress, above which rises the hill that forms the citadel; the causeway across the ditch admits only two persons at once, and is defended on the opposite side by a building with battlements. After passing the ditch the ascent is through an excavation into the heart of the rock, at first so low that a person is obliged to stoop nearly double. This passage opens into a high vault, lighted by torches, and terminating in a winding gradually sloping passage cut through the body of the hill, and about 12 feet high, and of the same breadth. From this gallery are trap doors, with flights of small steps to the ditch below, only of sufficient width to admit one person; and other passages and recesses for the reception of stores have been formed. The main passage opens into a hollow in the rock above 20 feet square, on one side of which, leaning against the cliff, a large iron plate is seen, nearly of the same size as the bottom of the hollow, with a huge iron poker. This plate is intended to be laid over the outlet, and a fire placed on it, in case the besiegers should obtain possession of the subterraneous passage. Through a hole three feet in diameter, is a strong current of air.

Elora, is a village not far from the city of Dowletabad, which is chiefly remarkable for the excavations of Hindoo temples, exceeding in magnitude and perfection every thing of the kind in that region of the globe, and entirely cut out of a solid mass of rock. The height of the rock out of which the court is excavated is 100 feet; the length of the grand temple is 142 feet; the breadth within is 61 feet, and the height of the ceiling 18 feet. The symbols in these excavations shew that some of them were formed by devotees of the Brahminical dogmas, and others by those of the Buddhists; but they are held in no veneration, and now visited by no pilgrim.

Bassein, is a sea-port town, separated by a narrow strait from the island of Salsette, and is about 27 miles north from Bombay. The surrounding territory, although long under a Mahratta government, is well cultivated, and many of the farmers are Roman catholic Christians.

Bombay, is a small island, consisting of two unequal ranges of whinstone rock, running nearly in a parallel direction to each other, and at the distance of three miles; the western ridge is about five miles in length, and the eastern ridge exceeds eight miles. Bombay is now the seat of the principal British settlement on the west coast of India, and has been already described in the order of the alphabet. See BOMBAY. But it may be added, that the population stated in that account seems to be overrated; for, from a census made by order of government in 1816, the whole number of inhabitants is estimated at 161,550. Ship-building has been conducted on a large scale at Bombay, and entirely under the management of Parsees. The teak timber, of which the ships are constructed, is brought from the western side of the Ghaut mountains by water carriage. In 1810 the Minden of 74 guns was launched, and since that time the Cornwallis and Wellesley, and another of the same size, have been built, besides two of 38 guns, two of 36, two of 18, and two of 10 guns; and, for commercial purposes, nine ships of 1000 tons, five of 800 tons, six of 700 tons, and five of 600 tons, with others of smaller magnitude.

Salsette, is an island formerly separated from Bombay by a narrow strait, but now united by a causeway, is about 18 miles in length and 13 miles in breadth, and although possessed of a soil which is well adapted for the cultivation of indigo, sugar, cotton, flax, and hemp, yet the greater part is almost wholly covered with jungle. Numerous mythological antiquities, and the remains of tanks, terraces, and surrounding flights of steps indicate the former prosperity of this insular spot; and in a spacious cavern are two gigantic figures of Buddha, nearly 20 feet high. The population is estimated at 50,000, one-fifth part of which belongs to the Christian persuasion, and, excepting petty quarrels among themselves, the inhabitants are a quiet tractable race. Tanna is a town and fortress commanding the passage between the island and the Mahratta territory on the mainland. It was taken by the British in 1773. The town is straggling, contains several Portuguese churches, and many Christian inhabitants.

Elephanta, is also an island in the bay of Bombay, about seven miles from the castle, and is remarkable for its spacious caves. See ELEPHANTA.

Mahratta.—The ancient territory of Mahratta, or Maharatta, originally included a geographical division in the north-west quarter of the Deccan. In this division were comprehended, it is supposed, Khandesh, Baglana, and part of Berar. But the Mahratta language is now more widely diffused, and, though not yet the vernacular dialect, it extends far beyond the ancient boundaries. This language, sprung from the Sanscrit, approaches nearly to the Bengalese or Hindostanee.

The peculiar features of the original Mahratta territory, in its mountains, defiles, and fortresses, render it singularly favourable for the prosecution of defensive warfare; and yet it is not a little extraordinary that the principal tribes of the Mahrattas are descended, as the names import, from the farmer, the shepherd, and the cowherd, all rural occupations, and not from any military caste; and the exterior appearance, the diminutive size, and mean rapacious look and disposition of the Mahratta, also mark a different origin. Among the Mahratta Brahmins, likewise, a similar diversity of character is observed. They neither associate nor intermarry with their neighbours, from whom they are distinguished by their own customs.

History is silent with regard to the Mahrattas till the 17th century, at which time it is supposed their country was divided into little principalities whose interests and influence were united under Sevajee, the first Mahratta commander, who was born in 1628, and died in 1680. During his time the territory of the Mahratta state was greatly extended; and his conquests were carried still farther by his son Sambajee. But the latter having fallen into the hands of Aurengzebe, he was put to death by that prince. His son and successor, Sahoo Raja, delegated his whole authority to a Brahmin, who issued orders for the whole details of government. After a long reign of 50 years, this weak prince, who was nearly forgotten before its conclusion, died in 1740. But, during this period, the extension of his territory, either by conquest or subjection to contribution, seemed almost unlimited. The whole of the Deccan and south of India acknowledged his authority; on the east and the west the sea formed the boundaries of his dominions, while they extended to cape Comorin on the south.

Sahoo Raja died without issue, and was succeeded by his nephew, Ram Raja, who was a very weak prince. This afforded a favourable opportunity to the aspiring ambition of the Peshwa Bajerow, the son of the Brahmin who was prime minister during the long reign of the former sovereign, to usurp the whole power of government, which he successfully accomplished, and fixed his capital at Poona; while Ragojee Bhoonsla, another minister, assumed the authority of the eastern portion of the Mahratta territory, and selected Nagpoor and Gundwana as the seat of his government.

These usurpations were followed by others, and were united for their mutual interests and defence in a general confederacy, which remained long under the influence and direction of Bajerow. Under this form of government the Mahrattas carried their successful ravages to the banks of the Indus, and through the rich provinces of Bengal, and wrested from the Portuguese the fortress of Bassein and the island of Salsette. The family of Sindia established themselves in Malwah and Khandesh, and afterwards extended their conquests to the northern parts of Hindostan; the Guicowar family seized a large portion of Gujerat, while the family of Holcar took possession of those parts of Malwah hitherto unoccupied by rival chiefs.

Bajerow died in 1761, and the office of Peshwa, now regarded as hereditary in his family, was left to his descendants. About this time the Mahrattas, who seldom engage in pitched battles, experienced one of the most sanguinary combats recorded in history, in the memorable battle of Paniput, with their formidable rival Ahmed Shah Abdalli of Cabul. This dreadful conflict checked their enterprising spirit, and arrested their predatory excursions for more than ten years. Madhoorow, the next Peshwa, died in 1772, and was succeeded by his son Narrain Row, who was murdered next year by his uncle Ragobah. But he failed in the object of his usurpation, for Sevajee Madhoorow, the posthumous son of Narrain Row, was proclaimed Peshwa, while Ragobah having concluded a treaty with the Bombay government, endeavoured but ineffectually to support and establish his claim with their assistance. This new measure of calling in the aid of a foreign power produced a combination against him of the whole Mahratta empire. Through the interference of the Bengal government, a treaty of peace was concluded; but the Bombay presidency having again undertaken the cause of Ragobah, a war ensued, and was soon terminated by a disgraceful convention. A general war afterwards commenced between the English and Mahrattas, and ended in a pacification in 1782. In 1784 the Mahrattas renewed the war against a number of petty dependent states, which extended along the western frontier of the company's dominions, and thus came in contact with the British dominions. In the two succeeding years the Poonah Mahrattas, in conjunction with the Nizam, carried on an unsuccessful war with Tippoo, and were compelled to purchase peace with the cession of some valuable provinces.

On the death of Sevajee Madhoorow in 1795, the empire was torn with internal dissentions; and after a fruitless attempt to place an infant Peshwa of a distant branch on the throne, to the exclusion of Ragobah's sons, they were at last elevated to the sovereignty. Bajerow the eldest first succeeded; in a few months he was dethroned, and his brother was appointed in his place; but within a short time he was restored to his former power and dignity. The authority of the Peshwa was at this time limited to the original territory; and in the federal combination in 1795 the nominal force under the Peshwa was estimated at 127,000 cavalry and infantry; but the real amount, it is supposed, scarcely exceeded half that number. But besides the army of regulars the Mahrattas are accompanied with predatory horsemen of all tribes, and who are chiefly Mahommedans; they receive no pay, but have the privilege of indiscriminate plunder, at their own risk and charge.

In 1802, Bajerow the second, being totally defeated near Poonah by Holcar, fled to Bassein, and entered into a treaty of alliance with the British government; in one of the conditions of which, it was stipulated that he should receive into his dominions a susidiary force of 6000 infantry. That force was increased in the succeeding year, when Bajerow was reinstated in his sovereignty at Poonah. A peace of comparatively considerable length now followed, although, from his rapacious disposition, he made many attempts to revive the claims for plunder, which among a people of such views and habits is considered as a just privilege.

The Peshwa, by his intriguing and treacherous conduct towards the British government, excited its suspicion in 1815, and by the measures he pursued endeavoured to form a general confederacy against it. To frustrate his designs, a body of troops was sent against him, his capital was surrounded, and he was compelled to fulfil an article in a former treaty, by which he was bound to keep up an auxiliary force of 5000 horse to co-operate with the British; and for their subsistence lands were to be assigned.

An open rupture occurred in the year 1817, and the first active movement of the Peshwa was to attack the British residency, from which Mr Elphinstone the commissioner, and his suite, had just time to escape. After some slight actions with detachments of the British troops, in which the Mahrattas were defeated, Poonah surrendered to their victorious arms, and the Peshwa became a wandering and desponding fugitive. Deserted by most of his chiefs, and accompanied by not more than 5000 horse and 4000 infantry, chiefly Arabs, he contrived for many months to elude the pursuit of his enemies. All hope of escape, or at least of recovering his dominions and enjoying his former power in security, having vanished, the fugitive Bajerow surrendered to the British government, renounced his sovereignty, agreed to accept of an annual pension, and had his future residence fixed at Pithoor in the vicinity of Cawnpoor. Thus the Mahratta confederacy was destroyed, and the name and authority of Peshwa annihilated.

Poonah is the modern capital of the Mahratta empire, is situated about 30 miles to the eastward of the Ghauts, and about 100 miles from Bombay. The city covers about two square miles, is but indifferently built, and open and defenceless. The lower part of the walls of some of the houses is constructed of square blocks of granite, and the upper part is composed of a frame-work of timber. The ancient palace or castle is surrounded by high thick walls, and has only one single entrance. The Moota river washes the north side of the city, and is about 200 yards broad, but quite shallow in the dry season. The Sungum, the residence of the British ambassador, is two miles distant from the city. The garden is watered by the rivers, and produces not only India fruits and vegetables, but is favourable for the culture of the vine; and the climate and soil are found suitable for the apple and beech trees, which thrive well. Near the British residency the Moota and Moola rivers form a junction; and on this spot five or six instances annually take place of the burning of widows with the corpse of their husbands.

The population of Poonah is supposed now to exceed 150,000; the markets are well supplied with all kinds of goods; and in one of the long streets, mirrors, globes, and lamps are exposed for sale. While Poonah was the seat of government, a great annual festival, called Dusserah, was celebrated on the 13th October, and was attended by the great Mahratta chiefs, with prodigious bodies of their followers; and on the conclusion of this festival, they departed on their predatory excursions into neighbouring countries.

Carli is a town 30 miles north-west from Poonah, and is remarkable for an extensive series of caverns, in a ridge of mountains in the vicinity, on the walls of which are carvings of elephants, of human figures, and of Buddha.

Chinchoor is a town about ten miles from Poonah, contains about 5000 inhabitants, and has good houses, clean streets, and shops well supplied with goods. Chinchoor is the residence of Chintamun Deo, who is supposed, by a great proportion of Mahrattas, to be an incarnation of their favourite deity Goonputty. Each Deo, according to the relation of the Brahmins, is burnt at his death, and from the ashes springs up a small image of Goonputty, which is set up in the tomb and worshipped. The palace of the Deo is a huge pile near the Mootah river, and its apartments are crowded with well fed Brahmins, the constant attendants of the divinity.

9. *Bejapoor* is a large province of the Deccan, which extends from the 15th to the 18th degree of north latitude, has for its boundaries on the north and east Aurungabad and Hyderabad, and on the south and west the Toombudra, Wurda, Canara, and the Indian ocean, and is estimated at 320 miles in length, and 200 miles of average breadth. The western parts of this province are mountainous, but the eastern districts are more level, and watered by the fine streams of the Krishna, the Toombudra, and the Beema. The productions of this province are similar to those of the other regions of the Deccan, but the horses reared on the banks of the Beema are held in great estimation by the Mahrattas. The population is stat-

ed at 7,000,000, of whom it is supposed not more than one twentieth part are Mahommedans. This province became subject to the British government in 1818, in consequence of the fall and subjugation of the Peshwa Bajerow, with the exception of the territory reserved for the Satarah Raja.

The Krishna river, which has its source in the Western Ghauts, not more than 42 miles from the west coast of India, advances in a south-westerly course till it passes Merritch, and, having received various tributary streams, bends to the eastward, and discharges its waters into the bay of Bengal. The Toombudra river derives its origin from two streams, one of which rises in the Western Ghauts. After flowing near a degree in a winding course, it joins the Krishna.

Bejapoor, formerly written *Viziapoor*, is the ancient capital of the province, and is remarkable for the immense extent of its fortifications. Its circumference is supposed not to have been less than eight miles. Within the citadel were included the palace, the houses of the nobility, large magazines, and extensive gardens; and, in the days of its prosperity, according to the exaggerated account of the natives, the city contained a million of inhabited houses, while at the present time it exhibits little else than a shapeless heap of ruins.

Concan is a large district of this province, occupying the sea coast, having Canara on the south, and the Western Ghauts on the east. The sea coast is much broken into small bays and harbours, which have been often found extremely convenient for piratical purposes. Angria, a powerful marauder of this description, had established absolute authority on this coast with considerable extent of territory, till he was subdued and expelled by the British in 1756. Fort Victoria and Severndroog were piratical stations, which were seized by the British at the period just alluded to.

Goa is a populous town in the southern portion of the Concan, and the capital of the Portuguese possessions in India. Goa was taken in 1510 by Albuquerque. During the French revolutionary war it was taken possession of by the British, and for some years occupied by their troops, but was restored after the peace of Paris in 1814. Since the re-establishment of peace, the trade between this settlement and the mother country has greatly revived.

Satarah is a strong hill-fortress of the province of Bejapoor, and is 56 miles south from Poonah. As the name imports, the number of walls, towers, and gates amounted to seventeen. The fortress is on the highest summit of the hill, and the access to it is by a narrow winding path, which admits only a single person at a time. The raja's palace is the only remarkable edifice within the walls.

Sevajee, the founder of the Mahratta empire, dispossessed the sovereign of Bejapoor of Satarah in 1651, and since that time the Peshwas have retained the real power, while, from political views, they pretend to derive their authority from the Satarah raja. In consequence of the revolution in the Mahratta empire in 1818, when the Peshwa was expelled and degraded, the Satarah raja was re-instated in his nominal sovereignty, and a portion of his ancient territory was placed under his authority.

SOUTHERN HINDOSTAN.—That portion of India which lies to the south of the river Krishna is included under this general appellation. The form approaches to that of a triangle, the base of which is the river Krishna, and the coasts of Malabar and Coromandel are the sides; the extent is about 600 English miles, and the greatest breadth is about 550 miles. The central table-land, which rises from 3000 to 5000 feet above the level of the sea, forms the most striking feature of this remarkable region. This elevated tract is separated by abrupt and mountainous declivities from the low flat countries on the east and west, which form a narrow belt between the hills and the sea. The central eminence is known by the name of Balaghaut, signifying above the Ghauts; and the lower belt is denominated Payeen-ghaut, denoting below the Ghauts.

Ghauts.—The ridge of mountains called the Eastern Ghauts commences about latitude 11° 20′ north, and extends nearly in a straight line to the banks of the Krishna, in north latitude 16°, separating the two Carnatics,—one of which, the true or proper Carnatic, is above the Ghauts, and the other, which is below the Ghauts, stretches along the coast of Coromandel. These mountains rise about 3000 feet above the level of the sea, and are chiefly composed of granite. The chain of the Western Ghauts extends from cape Comorin to the Tuptee or Surat river, and, following the course of that river, forms several Ghauts or passes. In their whole extent the Western Ghauts comprehend thirteen degrees of latitude, and are commonly about 40 miles, and never more than 70 miles, distant from the sea. The loftiest summits of this ridge rise 5000 feet above the level of the sea. In some parts of the ridge of the Western Ghauts, the mountains are covered with stately forests; the finest bamboos, growing in detached clumps, are the produce of these elevated regions; and, in the middle districts, the teak-wood, although of inferior size, is not uncommon.

1. *Canara* is a province on the west coast, extending from the 12° to the 15° of north latitude, having Goa and part of Bejapoor, Mysore, and the Balaghaut ceded districts for its boundaries on the north and the east, and the province of Malabar and the sea on the south and west. The extent along the sea-coast is 180 miles, and it covers a surface of more than 7000 square miles, chiefly ef rugged uneven country. Rice is the chief cultivated grain, and in some places two or three crops are annually produced. Cocoa-nut trees are cultivated in gardens on the sandy shore, or on the banks of rivers; and betel and pepper are raised above the Western Ghauts. The greater proportion of the lands in this province is private property, of which documents are found in inscriptions on stone and copper in every part of Canara.

The population of this province was supposed in 1807 to exceed 576,000, of which number the Brahmins composed more than a fifth part. In 1799, Canara was transferred to the British government, and now forms one of the collectorships under the Madras presidency; and since this change it has enjoyed tranquillity and general prosperity, while an obvious improvement in the dress and mode of living of the inhabitants is observed.

Mangalore is the chief town of the province, and a flourishing sea-port; is situated on a salt lake, separated from the sea by a sandy beach, in north latitude 12° 53′. The town is built round the sides of the peninsula, and in the elevated centre arose the fort. Mangalore was very early a great resort of Arabian vessels; and the trade in rice, betel nut, and black pepper, is still considerable. The population in 1806 was estimated at 30,000.

2. *Malabar.*—The province of Malabar extends along the western coast from cape Comorin to the river Chandraghiri, but it sometimes includes the whole country from the southern extremity to Bombay. The British province of Malabar is about 200 miles in length along the sea-coast, and may be divided into two portions, the first of which, and the most extensive, is composed of low hills separated by narrow valleys. The hills are in general steep, and the sides, on which the soil is of the best quality, are in many places formed into terraces, while the summits present large surfaces of bare rock. The second portion of the province, which is confined to the plain on the sea-coast, and is rarely more than three miles in breadth, consists of poor sandy soil. The plains near the hills are most level, and best fitted for the culture of rice; and the cocoanut tree thrives well on the low downs near the sea.

In 1800 the total population was estimated at 600,000, which is supposed to be under the real number. The towns and villages of this province are chiefly along the sea-coast. Rice is the principal cultivated grain; the cocoa-nut tree is also an important object of culture; and the black pepper vine, which requires much care and attention in its young state, is a valuable vegetable production. The peculiar features of this region have rendered it capable of resisting invasion; and hence it was not subjugated by the Mahommedans till the year 1766, when it was attacked by Hyder; and from this very recent intercourse with strangers, the original manners, customs, and institutions of the Hindoos have been preserved in greater purity than in most parts of India. Slavery exists in Malabar, and in some parts of the province the greater part of the labour is performed by those who are doomed to that degraded condition. The slaves, which are of different castes, are said to be severely treated. The Christian religion was early introduced into this province, and the number of Christians, including Syrians or Nestorians, is estimated at more than 200,000.

Malabar was subdued by Hyder in 1766, and in 1788 his son Tippoo made the bold attempt of converting the Hindoos to the true Mahommedan faith. Aided by a powerful army, he expelled the rajas, and confirmed his authority; and when hostilities commenced between the British and Tippoo in 1790, the rajas and nairs, the former sovereigns of the country, were leading a predatory life in the woods, or were fugitives in other provinces. At the conclusion of the war they were reinstated in their possessions by the Bombay government; but having failed to discharge the stipulated revenue, they were stripped of authority, and allowed one-fifth of the revenue of the country to support their dignity. Some of them were dissatisfied with this arrangement, and, appearing in arms, they were subdued by a military force. The province was then transferred to the presidency of Madras, and placed under the charge of a military officer.

Cananore is a town on the sea coast, which was purchased from the Dutch by the ancestors of the Biby or female sovereign, who is a Mahommedan. This female potentate possesses a very small territory; but she pays a revenue as land-tax, and the British government receives all the customs of the port. The Laccadive islands form part of her dominions, but add little to her resources. She possesses several vessels, which trade to Arabia, Bengal, and Sumatra. Cananore stands at the bottom of a small bay, and is defended by a fortress, which has been strengthened with walls since the province was ceded to the company. The exports from this place are chiefly pepper, cardamoms, sandal wood, coir, and shark fins; and horses, almonds, sugar, opium, camphor, benzoin, silk, and piece goods are imported.

Tellicherry is also a sea-port town, was long the chief settlement of the English on this coast, but has declined since the East India company's commerce was transferred to Mahe in 1800. It is still the residence of the richest natives, and the inhabitants are more civilized than in other parts of the province.

Mahe is now the chief French settlement on the coast of Malabar; is a neat town, with many good houses, situated on an elevated spot. This place was originally settled by the French in 1722. It fell into the hands of the British in 1793, and was finally restored, along with Pondicherry, at the peace of 1815. The principal export is pepper, which is the staple commodity of the province.

Calicut is a subdivision of the province of Malabar, lies on the sea coast between the 10th and 12th degree of north latitude, and one of the principal countries of the Nairs, a singular Hindoo race. The raja of Calicut, who was highly venerated by his subjects, is the Zamorin of Europeans; and pretending to a higher rank than that of the Brahmins, regards himself as only inferior to the invisible gods. Calicut is the capital of the province of Malabar, and was first visited in May 1498 by Vasco de Gama. In 1509, the Portuguese, with a strong body of troops, attacked Calicut, but were repulsed with great loss; in 1766 it was subdued by Hyder, who enlarged and improved the fort; but his son and successor Tippoo afterwards destroyed both the fort and town, and removed the inhabitants to Nellura or Furruckabad; but in 15 months afterwards, the province being conquered by the English, the inhabitants returned to their former residence. In 1800 the town contained more than 5000 houses. The principal exports are pepper, teak and sandal-wood, cardamoms, and wax.

Laccadive Isles, a cluster of small islands, extending from the 10th to the 12th degree of north latitude, and the nearest of which is about 75 miles distant from the coast of Malabar. The largest of these islands contains not more than six miles of superficial extent, and they are all surrounded with coral shoals, which render them almost inaccessible. The only vegetable productions are cocoa-nuts, betel-nuts, and plantains. The inhabitants are Mahommedans, very poor, and live chiefly on cocoa-nuts and fish. Their only exports are cocoa-nuts, a small quantity of betel-nuts, and coir or cordage, made from the husk of the cocoa-nut. These islands were formerly attached to Canara, and with that province came under the dominion of the British, and they are now subject to British authority.

Maldive Islands.—A groupe of islands extending from the equator to the 8th degree of north latitude, and subdivided into 17 clusters, each of which is surrounded by rocks that defend them from a stormy sea. The larger islands only are inhabited and cultivated, and the different trades and professions occupy distinct groupes. These islands are rarely visited by strangers, and the trade is chiefly carried on by the Maldivians in their own boats, which are constructed of the trunks of cocoa-nut trees. The produce of the cocoa-nut tree, cowries, salted fish, and turtle shell, are their chief exports, which they exchange for rice, sugar, cutlery, silk stuffs, coarse cottons, and tobacco. The residence of the king of Maldive is said to be regularly fortified and mounted with cannon. But the means of defence and protection possessed by this insular monarch must be extremely feeble, when the crew of the Europa, consisting of 43 persons, after being wrecked on an uninhabited island, and being removed by the Maldivians, and conducted to the seat of government, and treated with the greatest hospitality, seem to have been guilty of the most wanton outrage, in maltreating the natives and destroying their property, and even in attempting to take possession of the palace itself. These complaints were presented to the governor-general of Bengal in 1812. The natives of these islands profess the Mahommedan faith.

3. *Cochin* is a small principality on the Malabar coast, having the province of Malabar and the Dindigul district for its boundaries on the north and east, and Travancore and the sea on the south and west. The superficial extent of this territory is estimated at 2500 square miles, and about two-thirds is under the independent jurisdiction of the raja, while the remainder is subject to British authority. Rice is extensively cultivated in the northern parts of the province, and the same kind of trees grow in the forests of Cochin as in those of Malabar. Teak wood is abundant in some places, and finds a ready market in Bengal.

Many Nazarene or Christian villages, which are generally well built and cleanly, are found in the province of Cochin, and the Jews are numerous in the vicinity of the town of Cochin, where the ancient, or black Jews, as they are called, have a synagogue.

Cochin is the city from which the principality originally derived its name, but it has long ceased to form any part of the Cochin dominions. It has been successively in possession of the Portuguese, the Dutch, and finally of the British, to whom it was ceded in 1814. It formerly enjoyed a very extensive commercial intercourse with Arabia, and the trade is still considerable. Ship-building is also carried on, and vessels are constructed both according to the European and Asiatic models.

4. *Travancore.*—The province of Travancore occupies the south-western extremity of Hindostan, and extends from the eighth to the tenth degrees of north latitude; is bounded on the south and west by the sea, on the north by the territory of the Cochin raja, and is separated from Tinnevelly by a ridge of lofty hills, and is about 140 miles long, and 40 miles of an average breadth. In the vicinity of the mountains the country exhibits a varied scene of hill and dale and winding streams, which, as they traverse the vallies, preserve them in perennial verdure. The mountains are covered with lofty forests, and pepper, cassia, frankincense, and other aromatic gums, are enumerated among the vegetable productions; elephants, buffaloes, and tigers frequent the woods at the bottom of the hills; and monkeys and apes, which herd together in flocks and families, are extremely numerous. Rice is raised in great quantities, as well as pepper, betel-nut, and cocoa-nut trees, the three latter of which are taxed by the government. But, it is said that many of these vexatious and oppressive taxations have been either modified or abolished by the interference of the British power. In 1810 the British resident performed the duty of prime minister in this province; and in 1812, when he proposed to resign, the queen of Travancore and the raja of Cochin were extremely desirous that he should retain his official functions on their account. This resignation took place in 1814.

Travancore is the ancient capital of the province, but Trivanderam, 52 miles north-west from cape Comorin, the modern capital, is the usual summer residence of the Travancore rajas. The town is populous, and some years ago had a garrison of 1000 Nairs and 10,000 Sepoys. *Porca* is a town on the sea-coast, a populous place, and possesses considerable trade. *Coulon*, or *Quilon*, is also a sea-port town, was formerly a place of some note and has some trade. *Anjengo* is a small sea-port town, which was early fortified by the East India company; and the factory, which, in 1813, was transferred to the Bombay presidency, has been abolished as an unprofitable establishment. The best coir cables on the Malabar coast are made at Anjengo of the fibres of the Laccadive cocoa-nut.

5. *Balaghaut ceded Districts* include the territories acquired by the British government in 1800, and comprehending all that country to the southward of the Krishna and Toombudra rivers, which fell to the Nizam's share by the treaties of Seringapatam in 1792, and of Mysore in 1799. These districts occupy the central regions of the peninsula; and the Krishna and Toombudra, forming the boundaries on the north, are the only large rivers. In many parts of this territory, the soil, when moistened with seasonable rains, is fertile and productive; and, what is scarcely to be expected, drill husbandry is universal. War and famine have long produced the most disastrous effects in these regions. In 1800 the power and influence of Britain began to be felt, and tranquillity was in some degree restored; but a se-

vere drought in 1803 and 1804 threatened the desolation of the territory. The total number of inhabitants was estimated in 1806 at nearly 2,000,000.

A good deal of indigo is raised and exported, and coarse sugar is manufactured. Cotton is one of the chief productions; and diamond-mines have been discovered between the Krishna and Pennar rivers.

Bellary.—The Bellary district lies in the western division of the province, and contains the chief towns of Bellary, a hill-fort, Harponelly, Bijanagur, Adoni, Gooty, and Curnoul. Soondoor is a valley in which is a strong fortress; and a temple has been long celebrated and much resorted to as a place of pilgrimage.

Cuddapah.—The district of Cuddapah is a large division of the Balaghaut territories; and from the town of the same name, towards the Krishna river, the country presents nearly a level surface. Soda is collected on the hills in some parts of this district; and diamond-mines on the banks of the river Pennar, and near the town of Cuddapah, have been wrought for several centuries. The town stands on the banks of a river of the same name. The remains of the palace of the nabobs are still visible within a mud fort; and within the same fort is the prison, containing from 600 to 700 prisoners, condemned to work in irons for various periods, from one to 14 years, according to the atrocity of the crime. Cuddapah was long the capital of an independent Patan state. Large quantities of a coarse kind of sugar are made in the vicinity.

Sidout is a hilly district in the same territory, with a town of the same name in a valley, and 12 miles distant from Cuddapah; and *Punganoor* is a fortified town, with a small district attached, great part of which was occupied by the British government in 1799.

6. *Mysore.*—The province of Mysore, situated between the 11th and 15th degrees of north latitude, is inclosed between the Eastern and Western Ghauts, and is surrounded by the British territories under the presidency of Madras; is estimated at more than 200 miles in length, and 140 miles in average breadth, and is composed of high table-land, which is nearly 3000 feet above the level of the sea. To this elevated tract of country are to be traced the sources of all the rivers which fertilise the lower regions.

Excepting at a few passes, the Mysore country is altogether inaccessible; and as most of these practicable roads unite in Palicaud, when the territory of Hyder was invaded, his defence was confined to that single pass. The rocks are composed chiefly of syenite; common salt is found on the red soil in the dry season; soda, also, mixed with common salt, is collected among the Chitteldroog hills; and the province abounds with iron ore, which is converted into malleable iron by very simple apparatus. Rice is one of the principal cultivated productions, beside which, the sugar cane, leguminous plants, the poppy for extracting opium, the betel tree, and the cocoa-nut and fan-palm are objects of culture. Cows, buffaloes, three kinds of sheep, and the long-legged goat, are reared in the vicinity of Seringapatam. The native breed of horses is of small size.

The estimate of the total number of inhabitants in the Mysore Raja's territories, in 1804, amounted to more than two millions; and it is not a little singular that only about 17,000 families profess the Mahommedan faith, although the zeal of the sovereigns, Hyder and Tippoo, during their reign of 38 years, was unbounded to convert their subjects to the Mussulman doctrines. In 1760, Hyder Alikhan, an illiterate adventurer, assumed the sovereign power of Mysore, and, after various turns of fortune, died in 1782, and left his throne to his second son, Tippoo Sultan, who, at this time, had discovered considerable military talents. With the assistance of the French, he was almost constantly occupied either in invading his weaker neighbours or in war with the British. At the conclusion of the war in 1792, he was compelled to give up one half of his dominions. A new war commenced, and in 1799 his capital, Seringapatam, was stormed by the army under General Harris, and Tippoo himself fell in the desperate conflict, and with him terminated the Mahommedan dynasty of Mysore. The chief towns of this territory are Seringapatam, Bangalore, Bednore, Chitteldroog, and Sera.

Seringapatam, the modern capital of Mysore, stands at the upper extremity of an island formed by the river Cavery, which, at this place, is a broad and rapid stream. The island is about four miles long and one mile and a half broad. The fort is at the west end of the island, and occupies about a mile of its space. It is an immense unfinished mass of building. The palace at the east end, constructed of mud, is not without elegance, and a mausoleum of the princes of the Mahommedan race is in the vicinity. The tombs, which are of black marble and raised above the surface, are covered with rich cloths; and the establishment of priests and musicians to perform religious service is retained. The palace in the city is now occupied by the British resident and the British troops.

The total inhabitants of the island of Seringapatam were estimated, in Tippoo's reign, at 150,000, and of the city, exclusive of the garrison, about 31,000. The only manufactures of importance are said to have been military stores and camp equipage. Seringapatam is 290 miles from Madras, and 622 miles from Bombay.

Mysore is the ancient capital of the province, and the residence of the Mysore raja, who, on the fall of Tippoo in 1799, was restored to his nominal dignity. Tippoo destroyed the old town; but, since the restoration, a new town has arisen near the seat of government, and, in 1802, it consisted of one principal street a mile in length. Mysore is nine miles from Seringapatam.

Bednore, the capital of a district of the same name in the north-western extremity of Mysore, at one time is said to have contained 20,000 houses. At Tippoo's death it contained 1500 houses, and has since recovered some of its former prosperity.

Sera is 92 miles north-east from Seringapatam, and before it was conquered by Hyder was a place of great extent; but, in 1800, in consequence of the calamities of war and plunder, the number of houses was reduced to 3000.

Bangalore is a large fortified town, 70 miles north-east from Seringapatam. In 1805 the number of inhabitants was estimated at 60,000; and the trade in cotton, silk, and cloth is considerable, as well as that of betel-nut, black pepper, and sandal wood. The strong hill-fort of Severndroog is 20 miles from Bangalore. It was besieged by the British forces under Lord Cornwallis in 1791, and by a bold and rapid assault was taken in one hour in open day, and with only a single private soldier wounded in the attack.

Chitteldroog, the capital of a district, is 151 miles from Seringapatam, and stands in a country surrounded by low, rocky, bare hills, on one of which the fortress, reckoned one of the strongest in India, is constructed. This place suffered greatly during the calamities of war which prevailed in the Mysore previous to 1799.

7. *Coimbatoor* is a small province above the Eastern Ghauts, having the Mysore territories on the north, Dindigul on the south, Salem and Trichinopoly on the east, and the province of Malabar on the west, extending about 50 miles in length from north to south, and about 45 miles in breadth. The height of the table-land is estimated at 900 feet above the level of the sea. This province is watered by several rivers, of which the Cavery is the chief. The climate is described as healthy and pleasant, and the soil generally dry, and well adapted for the cultivation of grain. Many sheep are reared in this territory; rice is one of the principal crops. The towns are well built; and the art of weaving has been brought to considerable perfection. The total population is estimated at 600,000. Coimbatoor is under the Madras presidency, and was ceded to the British government in 1799.

Coimbatoor, the capital of the province, is 122 miles from Seringapatam, and in 1801 contained 2000 houses, although, in former times, the number was much greater. It was sometimes Tippoo's place of residence; and a mosque built by the sultan still remains.

Daraporam is a populous town in a high open country, is 139 miles from Seringapatam, and is defended by a large mud fort. Tobacco and rice are the chief productions of the neighbouring territory.

Palachy is a town 16 miles from Coimbatoor, and contains about 300 houses, with a small fort adjacent. From this point the rivers run east and west to the Coromandel and Malabar coast. In the year 1800 a singular discovery was made in the vicinity, of a pot containing many coins of the Roman emperors Augustus and Tiberius.

Caroor is a large town, 74 miles distant from the Western Ghauts, stands on a rising ground not far rrom the Cavery, is distinguished by its wide and handsome streets, and contains a considerable population.

Sivana Samudra is an island formed by the Cavery in North Coimbatoor, nine miles in length and one mile in breadth, and much celebrated for a magnificent cataract. A bridge, now in ruins, communicated with the island, and was constructed of large volumns of black granite, of 20 feet in length, and two feet in diameter. Directly opposite was the southern gate of a wall surrounding the city. The principal street of the city may still be traced, and many ruins of Hindoo temples, in one of which a gigantic statue of Vishnu is erected. The cataract is 150 feet in height, and in the rainy season the fall of a large body of water, in the midst of wild and romantic scenery, exhibits an imposing spectacle.

8. *Salem* and *Barramahal*.--This province is situated above the Ghauts, has the district of Cuddapah for its boundary on the north, Trichinopoly and Coimbatoor on the south, Mysore on the west, and the Carnatic on the east, and being on the summit of the table land is of great elevation. The Cavery, the Pennar, and the Palar, are the principal rivers.

Salem is the original capital of the district of the same name, is 114 miles south-east from Seringapatam, and has some trade in cotton goods and saltpetre.

Barramahal, is a sub-division of the Salem jurisdiction, which was ceded to the British government in 1792. The chief towns of this district are Kistnagherry, 106 miles east from Seringapatam, and situated in a plain which is singularly picturesque, with high rocky insulated mountains, one of which, 700 feet in perpendicular height, is occupied by the fortress; *Ryacotta*, which is 92 miles from Seringapatam, is also defended by a fortress, and was ceded to Britain in 1792; and Sautghur, 106 miles west from Madras, is situated on a picturesque spot, and in the vicinity of hills adorned with tamarind and banyan trees of great age and size.

9. The *Carnatic* is a large province, including the former territories of the nabob of Arcot, and extending from cape Comorin to the 16th degree of north latitude, a distance of about 560 miles, with an average breadth of about 75 miles, and having the Guntoor Circar for its northern boundary. This extensive territory forms three subdivisions, the first of which, called the Northern Carnatic, extends from the river Pennar to the river Gundezama, and has for its chief towns Ongole, Curwaree, and Samgaum. The Central Carnatic stretches from the Coleroon river to the river Pennar. The chief towns are Madras, Pondicherry, Arcot, Vellore, Cuddalore, Chingleput, Ginjee, Pullicat, Chandgherry, and Nellore; and the Southern Carnatic lies to the south of the river Coleroon, and comprehends the principal towns of Tanjore, Trichinopoly, Madura, Tranquebar, Negapatam, Tinnevelly, and Nagore. The principal rivers are the Pennar, Palar, Cavery, and Vaygaroo, which have their sources in the table lands above the Ghauts. The climate of great part of the Carnatic is extremely hot and sultry. The country is naturally divided into high and low lands, in the former of which all kinds of small grain are cultivated; and in the latter, where irrigation can be obtained, rice is the principal crop. Sugar and indigo are only cultivated in small quantities. The ass, for domestic purposes, is common among the low castes in the Carnatic; and fowls are employed as food by the same classes of people.

The population of this extensive province is supposed to exceed 5,000,000, although that number is often greatly diminished by disease and famine. The greater proportion of the inhabitants professes the Hindoo religion of the Brahminical persuasion. The

Mahommedans are but few in number; and the Christians of all denominations are estimated at 40,000, of which 20,000 are Roman Catholics. The Brahmins of the Lower Carnatic follow secular professions; are employed in the collecting of revenue and the administration of justice, and are exclusively the keepers of inns or choultries in the towns and on the roads for the accommodation of travellers. The Brahmins also rent a large proportion of the land, and employ slaves for its cultivation.

Numerous choultries, which are houses for the accommodation of travellers, have been erected in the towns and villages, and along some of the principal high roads. The smaller buildings of this description are single square rooms, open towards the street, where the roof is supported by large square pillars, and, as the edifice is not furnished with windows, excavations for lamps are formed in the walls. But the larger choultries are often magnificent structures, originally erected and endowed in consequence of a pious vow, or of the generosity of the prince or of some rich individual. Within 40 or 50 miles of Madras are such buildings, which have been erected by rich merchants of that city; but the dirty condition in which they are kept is not very agreeable to European manners. A Brahmin resides near the spot, and supplies the traveller with food and a mat to lie on; and in the tank or pond in the vicinity the pilgrims perform their ablutions.

Large temples and pagodas, the monuments of wealth and civilization, abound in the Carnatic. The pagodas are all of the same form. A wall of 15 or 20 feet high commonly incloses a large square area, in the middle of which is erected the temple, which never rises higher than the surrounding wall. In the middle of one of the sides of the wall is a gateway, over which is built a high tower, which is to be considered as a monument of the god to whom the temple is dedicated, as it exhibits the attributes and history of the divinity. The number of forts, chiefly of a square form, was formerly very great in the Carnatic; but during the long period of tranquillity which the country has enjoyed, they are fast going to decay.

In 1795 part of the Carnatic came under the management of the British government, and in 1801 the whole of the possessions of the nabob of Arcot were transferred to the same authority, a certain annual revenue being reserved for the native sovereign. Very extensive claims having been advanced against this territory, a commission was appointed both at home and abroad for the adjustment of these claims, and a fixed sum appropriated for the liquidation of the debts. This business commenced in 1805, and in the beginning of 1819 little progress had been made towards its final settlement.

During the prevalence of the northerly wind, or monsoon, on the coast of Coromandel, the southerly wind blows on the opposite coast of Malabar. The northerly winds are expected on the coast of Coromandel about the middle of October; and the periodical change which is followed by the rainy season, and frequently accompanied by severe hurricanes, is called the great monsoon. The weather seldom clears up till the middle of December, and the storms sometimes continue even as late as the beginning of January. The southerly wind sets in about the middle of April, and then great drought prevails on the coast. Every thing is parched up, and the country resembles a barren wilderness: but when the rains fall, the plants revive, and a rich verdure soon appears.

The coast of Coromandel being unprovided with harbours, landing from ships is attended with considerable difficulty, except at such places as are furnished with proper boats. These boats are of a light construction, and are made of thin planks sewed together, and with straw in the seams instead of caulking, to render them flexible and susceptible of yielding to the waves. In the management of these boats, great dexterity is required. When they come within the influence of the surf, the master stands up, and with great agitation marks time with his voice and foot, while the rowers work their oars backwards till they are overtaken by a strong surf curling up, which sweeps the boat along with tremendous violence, and then every oar is vigorously plied forwards that the boat may not be carried back with the receding wave. The boats belonging to ships in the roads sometimes proceed to the back of the surf, where they come to anchor and wait for the country boats to carry their passengers on shore. The catamaran is another kind of floating vehicle, constructed of two or three light logs of wood, eight or ten feet in length, fastened together, and having a small piece of wood inserted between them for the purpose of a stern piece. They are employed by the fishermen and lower classes, and usually hold two men, who, with their paddles, launch through the surf to fish, or to convey letters or refreshments to ships in the roads. Letters and papers are secured and protected from the water in a cap made of matting, which the catamaran men wear for the purpose.

The chief towns of the Northern Carnatic, it has been already noticed, are Ongole, Curwaree, and Samgaum.

Ongole is situated in a district of the same name, which was ceded to the British in 1801. It is 173 miles north by west from Madras, and was once strongly fortified, but the works are now in a state of decay.

Curwaree is a town in the same district, and is about 148 miles north from Madras.

Samgaum is situated on the north side of the Pennar river, and is about 17 miles north-west from Nellore.

The principal towns of the Central Carnatic, are Madras, Pondicherry, Arcot, Vellore, Cudalore, Chingleput, Ginjee, Pulicat, Chandgherry, and Nellore.

Madras is the capital of the British territory in the south of India, is situated in north latitude 13° 5', and east longitude 80° 21', and is distant from Calcutta 1030 miles, and from Bombay 770 miles. The flat sandy shores, the beech crowded with human beings, the public offices and store-houses with their fine colonnades, the fortifications of Fort George, and in the back ground the minarets and pagodas rising from among the trees, exhibit altogether a striking spectacle, as Madras and the scenery in the vicinity are seen from sea. Fort George, which is situated within a few yards of the sea, is a strong fortress, which was planned by the celebrated engineer Mr Robins. The old fortress, now converted into government offices, the church, and the exchange, on which a light-house 90 feet above the level of the sea is erected, are included within the walls. The government-house, a large edifice, is near the esplanade. Excepting a few houses in the fort, the European settlers reside entirely in their garden-houses, from which they repair to the fort in the morning for the transaction of business, and return in the afternoon. These garden-houses, which are in the neighbourhood of Madras, consist of one story, and have their porticos and piazzas supported by pillars. The walls are either white or coloured, and the floors are covered with rattan mats; and they are generally set down in the midst of a field planted with trees and shrubs. During the prevalence of hot winds, mats, made of the roots of a sweet-smelling grass, are placed at the doors and windows, and constantly watered; and thus the air blowing on them diffuses an agreeable fragrance and coolness in the apartments. The range of the thermometer at Madras is about 20°. In January, when it is lowest, it stands about 70°; and in July, when the temperature is highest, the thermometer rises to 91°. The botanic garden, established at a great expence, under the superintendence of the late Dr James Anderson, was greatly injured by a hurricane in 1807, and is now said to be in a ruinous condition. The soil in the vicinity of Madras, when properly cultivated, and when the season is favourable, yields annually two crops of rice.

The mode of living at Madras is similar to that at Calcutta, excepting that all kinds of provisions being less abundant are more expensive, and the society is on a more limited scale. Men of business repair to the fort in the early part of the day to transact business, and usually return about five o'clock. Those who are less engaged in business make their visits before two o'clock; and in the cool of the evening, fashionable parties, in their gayest equipages, frequent the mount-road, which is adorned with banyan and white tulip-trees, and drive as far as the cenotaph erected to the memory of lord Cornwallis, which is five miles distant from Fort George.—Among other amusements, monthly assemblies are kept up during the cold season, and occasional balls throughout the year.

The black town of Madras, which is separated from the first by a spacious esplanade on the north side, was formerly surrounded by fortifications, which are now in disrepair, is composed of brick and bamboo-houses, very irregularly disposed; and, according to a vague estimate of the population in 1794, contained 300,000 souls. This town is the residence of the native, Armenian, and Portuguese merchants, and of such European settlers as are unconnected with government.

In 1812, a college on the same plan with that at Calcutta, for the instruction in the country languages of young men who are destined to official situations, was established; and among the charitable institutions of Madras, a male and female orphan asylum are under excellent regulations and the best management. The jugglers of Madras have acquired great celebrity throughout all India for their dexterity, and they are particularly famous for the painful operation of swallowing a sword. Those who are destined to exhibit this disgusting feat, begin when they are very young with short bits of bamboo, which are gradually lengthened as the gullet and entrance to the stomach can bear distension.

In the year 1639 the first establishment of the English took place at Madras, and a fort was immediately constructed by Mr Day, between whom and the native sovereign the transaction was completed. Since that period Madras has been the scene of some very active military operations, the most memorable of which was a siege by the French of several months in 1758, which, after destroying almost every building within the fort, they were compelled to raise with great precipitation, and entirely to abandon the enterprise. A supreme court of justice is established at Madras, composed of a chief-justice, and three other judges; and six barristers and eight attornies are attached to the court.

The whole territories south of the Krishna river, some tracts to the north of that river, and the Northern Circars, are subject to the Madras presidency, with the exception of the countries still under the nominal authority of the rajas of Mysore, Travancore, and Cochin, who, while they enjoy a limited management within their respective states, are subordinate to the British power, furnish large annual contributions, and are protected by a subsidiary force. Exclusive of the inhabitants subject to the rajas of Mysore, Travancore, and Cochin, the total population of these provinces was computed in 1810 to exceed 12,000,000; but this estimate, which was then supposed to be too low, is now thought, after a period of uninterrupted peace, to be greatly under the truth.

Arcot was the former capital of the Carnatic, is 68 miles south-west from Madras, stands on the south side of the Palar river, and is chiefly inhabited by Mahommedans. The district of Arcot has been divided into the northern and southern, which are so distinguished from their position. Arcot, Vellore, Chitoor, and Tripetty are among the chief towns belonging to the former, and the principal trading ports of the latter are Cudalore, Portonovo, and Pondicherry.

Pondicherry stands on the sea-coast of the Carnatic, 85 miles south from Madras, and was once the most splendid European settlement in India. The sandy plain on which it is situated produces only palm trees, millet, and a few herbs, but cotton and rice are cultivated in the surrounding territory. Pondicherry, since it first came into the possession of the French, in 1672, has experienced many changes, and numerous reverses of fortune. It was taken by the Dutch in 1693, unsuccessfully besieged by the British in 1748, but yielded to their arms in 1761, and was restored in 1763. Having fallen under the dominion of Britain in 1778, it was again transferred to the French in 1783, surrendered to the British in 1793, and was again restored in 1802. In 1803 it was re-occupied by a British garrison, and was finally given up in 1817 to its first European masters. The number of inhabitants was estimated in 1802 at 25,000.

Vellore, a town and fortress, to which a district was formerly attached, is 80 miles nearly west from Madras, and commanding the main road to the Mysore, was once a post of great importance. The fort, which is built of large stones, is surrounded by a deep and wide ditch, excepting at the entrance by a causeway. In the surrounding territory the rice fields are watered by means of canals, and some indigo is cultivated near the banks of the river Palar.

Ginjee is a town and fortress, and 35 miles north-west from Pondicherry. The fort is constructed on a lofty rock, and has been deemed impregnable.

Cudalore is a town on the sea coast 16 miles south from Pondicherry, and from its position is a place of great natural strength. The East India Company had a factory at Cudalore in 1690. In 1782, it surrendered by capitulation to the combined army of the French and Hyder Ali; and in the succeeding year it was closely besieged by the British troops, and, after some severe actions, hostilities ceased in consequence of the general peace.

Chingleput, is the capital of a district of the same name, and is 38 miles south-west from Madras. This place is fortified with a rampart, and a wide and deep ditch. The district of Chingleput stretches more than 100 miles along the shore, and extends inland 40 miles. This territory was formerly denominated the Jaghire, in consequence of the revenue being farmed, and was obtained by the East India Company from the nabob of Arcot in 1750 and 1763. Conjeveram is another considerable town in the same district, is 48 miles south-west from Madras, stands in a valley, and is from five to six miles in length. The streets are spacious, cross each other at right angles, and are adorned on each side with rows of cocoa-nut trees. The weavers, who manufacture red handkerchiefs, turbans, and cloths for the use of the natives, form a numerous class of the inhabitants. The great pagoda is a lofty building, and is considered a place of such sanctity that no strangers are admitted to the interior.

Pulicat, stands on the sea coast, 23 miles north from Madras. A lake, 40 miles in length, and about six miles at its greatest breadth, has been formed in the vicinity, by the sea breaking through a low sandy beach, and overflowing the flat lands. The Dutch were established at Pulicat as early as the year 1609, and in 1795 it became a British possession.

Tanjore is the capital of a principality of the same name, is 182 miles south-west from Madras, and includes two forts, one of which contains a celebrated pagoda, reckoned the finest specimen of the pyramidical temple in Hindostan. In remote ages Tanjore was the principal seat of learning in the south of India. The raja of Tanjore still retains his nominal authority, but his territory is altogether under the management of the British government. From his connexion with the English he has acquired a knowledge of their language, has collected a library of English books, and reads English newspapers. The burning of widows at the funeral pile of their husbands is still frequent in this district. In the vicinity of Combooconum, a town 23 miles north-east from Tanjore, and chiefly inhabited by Brahmins, are many fine tanks and pagodas; and at the same place, a consecrated pond, which every twelfth year possesses the virtue of cleansing all who bathe in it from their sins, is, at that time of remarkable purification, frequented by innumerable swarms from all quarters.

Nagore is a sea-port town in the Tanjore district, and is 13 miles south from Tranquebar. The trade of this place is considerable, and the exportation of piece-goods to the isles of France and to America is extensive. The imports, which are also considerable, consist of spices, wheat, sugar, coffee, and arrack.

Tranquebar, originally a Danish settlement, was, with a small adjacent territory, purchased by the Danish East India company from the raja of Tanjore in 1616. It stands on the sea-coast of the Tanjore district, and is 145 miles nearly south from Madras. This place was taken possession of by the British in 1807, but was restored to the Danes in 1814, and has since improved in commerce and population.

Negapatam is a sea-port town in the Tanjore district, 20 miles south from Tranquebar. It was taken from the Dutch in 1781, and finally ceded to the British in 1783.

Trichinopoly is the capital of a district of the same name, stands on the south side of the Cavery, and is 118 miles south-west from Pondicherry. Trichinopoly sustained a memorable siege by the French and their native allies from the year 1751 to 1755; but the valour of the British troops finally prevailed. Opposite to the city of Trichinopoly the Cavery separates into two branches and forms the island of Seringham, which is remarkable for a pagoda the outer wall of which is nearly four miles in circumference, beside which it has six other square inclosures, in the innermost of which the chapels are erected. This pagoda is resorted to by pilgrims from all parts of Hindostan.

Madura is an ancient city, the capital of a district of the same name, and 130 miles north by east from cape Comorin. The streets are narrow and filled with dirt and rubbish; and the population, which some years ago was estimated at 40,000, has decreased to half that number. The offerings made to the divinity, in a famous temple at this place, consist of large leather shoes finely ornamented.

Tinnevelly is the capital of a district of the same name, and is 59 miles north-east from cape Comorin. The town, which is large and populous, stands about 25 miles eastward, and is surrounded on three sides by extensive rice-fields watered from the river, and on the west by high rocky ground.

The district of Tinnevelly lies between the eighth and tenth degrees of north latitude, and occupies the south-eastern extremity of the peninsula; it is separated from the island of Ceylon by the gulph of Manaar. Travancore forms its boundary on the west. The chief productions of the district are rice and cotton, which latter is of a superior quality.

Of the numerous Works on India, and Indian affairs, the following may be recommended to the attention of the reader who wishes to obtain fuller information of that remarkable portion of the globe. Robertson's *Disquisition on India*; Rennell's *Memoir of a Map of Hindostan*; Mill's *British India*; Buchanan's, C. *Christian Researches*; Buchanan, (Hamilton) F. *Travels in Mysore, and Account of Nepaul*; *Asiatic and Bombay Researches*; Hamilton, W. *Geographical, Statistical, and Historical Account of Hindostan,* at the end of which the author gives an ample list of works as the sources of the materials of his own very elaborate compilation.

CONTENTS OF HINDOSTAN.

I. Northern Hindostan - 191
1. Sutuleje and Jumna - 192
Cahlore - - ib.
Hindoor - - ib.
Sirmore - - ib.
Bussaher - - ib.
Keonthul - - ib.
2. Gurwal or Garhawal - ib.
Serinagur - - ib.
Kalunga fortress - 193
Devaprayaga - 194
Gangoutri - - ib.
Bhadrinath - - ib.
3. Kumaon - - 198
Almora - - ib.
Chumpwit - - ib.
Niti - - ib.
4. Nepaul - - ib.
Catmandoo - - 200
Lalita Patan - ib.
Bhatgong - - ib.
Kirthipoor - - ib.
Gorkha - - ib.
Chinachin - - ib.
Muckwanpoor - ib.
5. Sikkim - - ib.
II. Hindostan Proper - ib.
1. Bengal - - ib.
Calcutta - - 201
Sunderbunds - 202
Burdwan - 203
Chittagong - ib.
Dacca Jelalpoor - ib.
Rajshahy - - ib.
Rungpoor - - ib.
Cooch Bahar - ib.
Dinagepoor - 204
Purneah - ib.
2. Bahar - - ib.
Boglipoor - - ib.
Tirhoot - - 205
Sarun - - ib.
Ramghur - - ib.
3. Allahabad - - ib.
Benares - - 206
Mirzapoor - - ib.
Juanpoor - - 207
Bundelcund - ib.
Caunpoor - - 208
4. Oude - - ib.
Lucknow - - 209
Oude - - 210
Gorucpoor - ib.
5. Agra - - ib.
Futtypoor - 211
Mathura - - ib.
Etaweh - 211
Furruckabad - ib.
Gualior - - 212
Bhurtpoor - ib.
6. Delhi - - 213
Paniput - - 214
Rohilcund - ib.
Hurdwar - 215
7. Lahore - - 216
Lahore city - ib.
Puckely - - 217
Calanore - - ib.
Kangra - - 217
8. Cashmere - - ib.
Cashmere city - 218
Islamabad - ib.
9. Ajmeer, or Rajpootara - ib.
Kishenghur - 219
Bhatneer - - 220
Chooroo - - ib.
Nagore - - ib.
Jeypoor - - ib.
Rampoora - - ib.
Chitore - - 221
10. Mooltan - - ib.
Sinde - - ib.
Hyderabad - 222
Nusserpoor - ib.
Tatta - - ib.
Corachie - - ib.
11. Cutch - - ib.
Bhooj - - ib.
Mandavie - ib.
Anjar - - ib.
12. Guzerat - - 224
Puttunwar - 225
Theraud - - ib.
Palhanpoor - - ib.
Radhunpoor - - ib.
Patree - - ib.
Junaghur - - 226
Bhownuggur - ib.
Chumpaneer - ib.
Cambay - - ib.
Katra - - ib.
Kupperwunje - 227
Baroda - - ib.
Broach - - ib.
Zinnore - - ib.
Surat - - 228
Damaun - - ib.
13. Malwah - - ib.
Chanderee - 230
Oodjeir - - ib.
Indore - - - ib.
III. Deccan - - 231
1. Gundwana - 231
Nagpoor - - ib.
Ruttenpoor - ib.
Ryepoor - - 231
Sumbhulpoor - - ib.
Munda - - ib.
2. Orissa - - ib.
Cuttack - - 232
Balasore - - ib.
Juggernauth - ib.
Khoordahghur - 233
3. Northern Circars - ib.
Ganjam - ib.
Vezagapatam - ib.
Rajamundry - ib.
Masulipatam - ib.
Guntoor - - ib.
4. Khandesh - - 234
5. Berar - - ib.
6. Beeder - - ib.
7. Hyderabad - ib.
Golconda - - ib.
8. Aurungabad - 235
Ahmednuggur - 235
Dowletabad - ib.
Elora - - ib.
Bassein - - ib.
Bombay - - ib.
Elephanta - 236
Mahrattas - ib.
Poonah - 237
Carli - - ib.
Chinchoor - - ib.
9. Bejapoor - - ib.
Bejapoor city - - 238
Concan - - ib.
Goa - - ib.
Satarah - - ib.
IV. Southern Hindostan - ib.
1. Canara - - ib.
Mangalore - 239
2. Malabar - ib.
Cananore - - ib.
Tillicherry - ib.
Mahe - - ib.
Calicut - - ib.
Laccadive isles - ib.
Maldive isles - 240
3. Cochin - - ib.
4. Travancore - ib.
Travancore city - ib.
Porca - - 240
Coulon - - ib.
Anjengo - - ib.
5. Balaghaut ceded districts ib.
Bellary - - 241
Cuddapah - - ib.
Sidout - - ib.
6. Mysore - - ib.
Seringapatam - - ib.
Mysore - - ib.
Bednore - - ib.
Sera - - ib.
Bangalore - - ib.
Chitteldroog - 242
7. Coimbatoor - - ib.
Daraporam - - ib.
Palachy - - ib.
Caroor - - ib.
Sivana Samudra - ib.
8. Salem and Barramahal ib.
9. The Carnatic - - ib.
Ongole - - 243
Curwaree - - ib.
Samgaum - - ib.
Madras - - ib.
Arcot - - 244
Pondicherry - - ib.
Vellore - - 245
Ginjee - - ib.
Cudalore - - ib.
Chingleput - - ib.
Pulicat - - ib.
Tanjore - - ib.
Nagore - - ib.
Tranquebar - - ib.
Negapatam - - ib.
Trichinopoly - - ib.
Madura - - ib.
Tinnevelly - - ib.

HINZUAN, one of the Comora islands, which are situated between Madagascar and the African continent, and is otherwise called Johanna, and by some other names. The surface is mountainous and richly clothed with wood. All the tropical fruits are abundant; and as fresh provisions are plentiful, it is considered a favourable place of refreshment for vessels navigating those seas.

HIPPARCHUS, an ancient astronomer, was a native of Bithynia; and, from the observations of the heavenly bodies which he made and recorded, it appears that he flourished between the years 160 and 125 before the Christian era. He was the first that reduced the scattered facts of astronomy into a systematic form; he was also the first that made a catalogue of the fixed stars, and he calculated and drew up a list of eclipses for a period of 600 years. He discovered the precession of the equinoxes, or the slow apparent motion of the fixed stars from west to east, by which they seem to have performed a complete revolution in a great number of years. The only work of Hipparchus now extant, is a "Commentary upon the phenomena of Aratus," which is a criticism upon that poem. The commentary was first published at Florence about the middle of the 16th century, and a more correct edition appeared at Paris in 1650.

HIPPIA, Shrubby Tansey, a genus of plants belonging to the Syngenesia class.

HIPPOBOSCA, Horse Fly, a genus of insects belonging to the order of Diptera.

HIPPOCAMPUS, Sea-Horse, the specific name of a fish belonging to the genus Syngnathus. See *Syngnathus* under Ichthyology.

HIPPOCASTANUM, the specific name of the common horse-chesnut, belonging to the genus Æsculus, and Heptandria class of plants. The fruit of the horse-chesnut has been recommended as a wholesome and nourishing food for cattle, sheep, and poultry.

HIPPOCENTAUR, a fabulous monster alluded to by the ancients, and supposed to be half horse and half man. The origin of the fable is traced to a people of Thessaly who lived near mount Pelion, and were thus denominated because they were the first that taught the art of riding on horseback.

HIPPOCRAS, a cordial medicinal drink, composed of wine and different spices, and formerly much used among the French, and recommended by the older practitioners of this country.

HIPPOCRATEA, a genus of plants belonging to the Triandria class.

HIPPOCRATES, the most famous of ancient physicians, and usually styled the father of medicine, was a native of the island of Cos, and was born about 460 years before the Christian era. He was the son of Heraclides, in whom the line of hereditary physicians is traced to Æsculapius, and his maternal descent is derived from Hercules; but this account of his pedigree seems to be somewhat blended with ancient fable. Of the early part of his life little is known; but he seems to have spent much of his time in travelling. The reputation that he acquired as a successful physician procured for him an invitation to the court of Perdiccas, king of Macedon, as well as to different cities of Greece. The fame, indeed, which he acquired, has placed him among the great men of Greece; statues were erected to his memory, and his maxims were received and long continued as unquestionable authority in the schools of medicine. He died at Larissa in Thessaly at a very advanced age, and, according to some, when he had exceeded his hundredth year.

Hippocrates wrote in the Ionic dialect; but many of the works ascribed to him are generally admitted to be spurious. His leading principles in medicine are, that the human body possesses a self-acting and self-sufficient power, which regulates all the corporeal movements and cures diseases; and that in acute diseases, a sudden change or crisis, either favourable or unfavourable, takes place on certain days, and is indicated by certain signs. For an account of the works of Hippocrates, Haller and Le Clerk may be consulted; and the principal editions are those of Venice in 1588, and of Frankfort in 1595, both in folio. They have also been printed in octavo; and the Parisian edition of Renatus Chartier, which includes the works of Galen, extends to 14 volumes folio.

HIPPOCRENE, a celebrated fountain of mount Helicon, sacred to the muses.

HIPPOCREPIS, Common Horse-shoe Vetch, a genus of plants belonging to the Diadelphia class.

HIPPODROME, derived from the Greek, and signifying a horse course, was the place in which chariot and horse races were performed among the ancients. The Olympian hippodrome was near the city of Elis, and on the banks of the river Alpheus; and the remains of a famous hippodrome, which was begun by Alexander Severus and finished by Constantine, are still to be seen at Constantinople.

HIPPOMANE, Manchineel-tree, a genus of plants belonging to the Monœcia class. See Botany.

HIPPOPHAE, Sea Buckthorn, a genus of plants belonging to the Diœcia class.

HIPPOPOTAMUS, the River Horse, a genus of quadrupeds belonging to the order of Belluæ. See Mammalia.

HIPPURIS, Mare's-tail, a genus of plants belonging to the Monandria class. See Botany.

HIRÆA, a genus of plants belonging to the Decandria class.

HIRE, Philip, De La, an eminent French mathematician and astronomer, was born at Paris in 1640, and being destined to the profession of his father, who was a painter of some reputation, he was instructed in those branches of mathematics which relate to the principles of design, and soon discovered a strong partiality for the study of geometry. The declining state of his health rendered a journey necessary to enjoy the mild climate of Italy, and he remained in that country four years, during which he made rapid progress in mathematical learning. On his return to his native city he continued the same studies, and soon distinguished himself as a profound geometrician. In conjunction with the celebrated Picard, he was employed at the suggestion of the minister Colbert, to make observations for constructing an accurate map of France; in this labour he was engaged several years; and along with other members of the academy of sciences, of which he was a member, he was engaged in taking the necessary levels for the grand aquæducts projected by Lewis XIV. He died in 1718, at the advanced age of 78.

The labours in which De la Hire was engaged were indefatigable; for besides being professor of the Royal college, and of the academy of Architecture, every hour he could command through the day was spent in study, while the night was devoted to astronomical observations. Of the numerous works which he published, the principal are a treatise on Mechanics, A New Method of dividing Conical and Cylindrical Surfaces, New Elements of Conic Sections, and some others, in the French language; Conic Sections in nine books, regarded as an original work, Astronomical Tables, in Latin; and the works of the ancient mathematicians in Greek and Latin; and during a period of more than 50 years he contributed numerous smaller treatises to periodical journals and the memoirs of the academy of Sciences.

HIRTELLA, a genus of plants belonging to the Pentandria class.

HIRUDO, the Leech, a genus belonging to the order Vermes. See Helminthology.

HIRUNDO, the Swallow, a genus of birds belonging to the order of Passeres. See Ornithology.

HISPA, a genus of insects belonging to the order of Coleoptera. See Entomology.

HISPANIOLA, or St Domingo, or Hayti, the aboriginal name, which has been resumed since it was declared a free sovereign and independent state, during the French revolution. See Domingo St.

HISTER, a genus of insects belonging to the order Coleoptera. See Entomology.

HISTORY.

Definition.—History has been defined by Dr Johnson in three ways; as "a narration of events and facts delivered with dignity;" as synonymous simply with narration or relation; and, lastly, as "the knowledge of facts and events." These definitions may perhaps be fairly enough deduced from the etymology of the word, which is taken from a Greek verb signifying *to know*, or, still more correctly, *to see;* but they are not very suitable to the use which is often made of the term, or which is purposed by it in this place. The sense in which it is here taken may be expressed by these words:—"The art of narrating events and describing facts so as to denote the time of their occurrence, their order, and connection." According to this definition, then, history is a particular department of science, as well as a branch of literature,—possesses certain laws, and aims at specific objects.

1. *Preliminary remarks.*—The value of this definition will be readily understood, by considering some of the usual applications of the term, and comparing them with those of other denominations of art or science.

Thus, then, we hear of *general history*, *elements of general history*, *universal history*, and several good works are to be met with under these titles, or some modifications of them. It is certain, that in course of time, and after a little inquiry, the meaning of these expressions is comprehended. But what, it may be reasonably asked, do they first of all denote to any person, who previously knew no more of the word history than what is to be gathered from any of the three definitions above quoted? Surely not a recital of the origin, progress, and fate of nations only,—because it would immediately occur to him, that there are many events and facts highly worthy of being recorded, in which mankind are not directly concerned, and which very little or in no respect at all relate to the condition or fortunes of human societies. As examples, may be mentioned all those parts of natural philosophy and natural history which are, strictly speaking, either descriptive or narrative. These terms, therefore, would suggest to him something more general and comprehensive, than what is intended by them; and, unless his taste particularly inclined him to the study of what is commonly called history, he would be a good deal disappointed at perceiving, that the subject to which his attention was directed in any work so denominated, excluded an immensity of circumstances and operations which are of high importance in the constitution of the world, and which plainly manifest the wisdom and the goodness of Him who formed it. Again, in the application of the term history to the case of a particular country, as the history of England or France, it will often be found that no more is contemplated than the series of kings who have reigned in it, and the chief political features of their respective times,—while the progress of literature, of art, commerce, and manners, is greatly overlooked, though, to many persons, of more interest than the topics which are discussed, and, while the physical peculiarities and changes of the country itself seem never once to have been thought of, as comprehended under the title which is thus adopted.

Now, admitting for a moment the propriety of such applications of the term, it must also be admitted that the same word may, with equal correctness, be used in reference to the life of an individual, the proceedings of an associated body, the steps in the cultivation of any art or science, the delineation of any remarkable place; and that hence, such titles as The history of Nadir Shah, The history of the Royal

Remarks.

Society, The history of Music, The history of the Cathedral Church of Salisbury, are as defensible on principle as they are frequent in practice. Without questioning this point, therefore, or raising a single objection to these diversified applications, it is here imagined that there is something common in all the cases adduced—and many more might have been enumerated—that justifies the employment of the word history to designate them; and all that is here contended for is, the allowableness of taking that word in the wider sense in which we have defined it, and which, it is believed, is the just exposition of its meaning in these examples of its enlarged acceptation. In the following pages it is accordingly proposed to treat,—not of the general or the particular subject so often styled history, that is to say, neither of the history of nations or kingdoms at large, nor of the history of any individual nation or kingdom, considered as an exemplification of the art,—but of the art itself, that branch of science defined above, which "narrates events and describes facts, so as to denote their time, order, and connexion;" and which may be equally manifested on a variety of topics, as the origin and progress of the different nations of mankind; the fortunes of a particular state; the life and actions of a remarkable personage; the transactions of a learned association; the rise and extension of a church or a religious sect; the successive steps by which an art or a science has been brought from infancy to maturity; and the ancient, intermediate, and present condition of any noted place, or celebrated structure.

The propriety of this peculiar, and, it is believed, philosophical use of the term, may be still more evidently made out by adducing some real or supposed examples of its application and misapplication. The term geography, which, strictly speaking, and according to its etymology, signifies a description or delineation of the earth, is used in various senses and with various degrees of extension. Thus Dr Watts, to whom Dr Johnson refers in place of giving a definition of his own, says, "Geography in a strict sense signifies the knowledge of the circles of the earthly globe, and the situation of the various parts of the earth. When it is taken in a larger sense, it includes the knowledge of the seas also; and, in the largest sense of all, it extends to the various customs, habits, and government of nations." And more modern writers, especially Pinkerton and Playfair, who have written voluminously on the subject, extend and subdivide it in a still greater degree, so as to comprehend under it a good deal of astronomy, geometry, and other sciences. Now, without disputing these authorities, it may safely be affirmed, that a gross blunder would have been committed in a dictionary of arts and sciences, such as is meant by the long established title of Encyclopædia, if the treatise, under the word geography, in place of treating, as has been done in this individual work, of the art or science "which teaches the form, composition, and division of the globe," &c. had been confined to one only of the branches into which geography is subdivided by those writers,—for example, to the ecclesiastic geography of Pinkerton, that division "which describes the government of the church, as divided into patriarchates, archbishoprics," &c. &c. But this impropriety would in no respect be greater than what is frequently committed by applying the term history, in the manner above mentioned, to a particular class of facts, that, namely, which relates to nations or kingdoms. The subject of grammar, considered as signifying the art of speaking and writing correctly, or the "art which teaches the relation of words to each other," would certainly be thought very slightly treated in a work of this kind, if the essay or article so denominated, in place of discussing the general principles which regulate speech and written composition, were entirely confined to the rules of one language, as the Latin or French. Yet this would not be more incorrect than, under the title of history, in the same work, to treat merely of the four great empires of the ancient world, and the states which were connected with or arose out of them. Poetry, again, which has been defined "the art or practice of writing poems," would be very indifferently disposed of, if a work professing to treat of it were occupied entirely with the epopee, to the neglect of several other interesting species of verse; and equal injustice would be done to painting, "the art of representing objects by delineating their forms and exhibiting their colours," if nothing more were given under the title than some rules for copying flowers and plants. But these two words stand precisely in the same predicament with history, as signifying not only certain arts, but also particular productions of these arts; and thus we speak of a variety of compositions being, respectively poetry, painting, or history. As, therefore, the first and the second of these are, with perfect propriety, employed to designate treatises on the philosophical principles of the arts so called, it is thought to be equally warrantable to adopt the last in the strict sense and for the purpose already explained.

Materials.

If the reader give any credit to these preliminary observations, he will not be offended at the novelty of the manner in which the subject of history is here discussed; nor, considering the extremely meagre and unsatisfactory sketches of events which are complimented with the name in almost all the Encyclopædias in existence, is it likely that he will be disposed to regret our having, in this instance, left the beaten track, where there is not a single beauty remaining to allure or reward our labour.

We proceed now to consider, in the first place, the materials which constitute the subjects of history, or which it professes to collect, to methodize, and to delineate.

SECT. I. *Materials of History.*

Viewing the universe as the creation of one intelligent and all-powerful being, every thing in it must be regarded as connected, immediately or more remotely, with every other. The known or admitted attributes of His character preclude the idea of any want of relation among what seem to us the distant portions of his works; and every inquiry into them, to be truly philosophical, must not only be founded on the conviction of the existence of a general system, to which the vast number of particulars that may engage the attention are to be referred, but also terminate in the discovery of a specific dependence of the object investigated. A familiar example will illustrate the superiority of such a spirit of inquiry over those oscillations of thought, in which, from constitutional indolence, we are so apt unprofitably to consume our time, while every thing around us is full of wonder and invites to intellectual exertion. The drops of rain, which glitter on the branches of yonder lilac tree, are quite unimportant to the "brute unconscious gaze" that we may chance to direct towards them,—or produce, perhaps, but a momentary emotion in us, as they reflect the many coloured rays of light, and, gradually losing their support as they increase in size, at length fall to the earth. Poetry, one of the offices of which is to find or to fancy a language in nature, may avail itself of this image, and work out from it either an agreeable or a painful moral; but, without regarding such a fictitious agency, let us confine ourselves to what is or may be ascertained and demonstrated in this phenomenon, considered strictly on scientific principles. Whichever way we proceed,—backwards to the past, forwards to the future---what a series of events and circumstances has to be developed in strict relation to it; what laws, dependencies, and consequences have to be explored,---in a word, what a history might be given of a single particle of water, if our philosophy were acute enough to detect, and our patience and time ample enough to narrate, its origin and progress, its alliances and decompositions, its interminable mutations and revolutions! This is only a solitary instance; but the same remarks may be applied to every object in nature; and, in reality, it is nothing but our listlessness and ignorance which prevent us from seeing the importance, or tracing the high connexions of the most humble, and apparently most unallied portions of the universe. This general observation, then, comprehends not merely the material world, as divided among the various physical sciences, but relates also to the moral and the intellectual. Here nothing is insignificant; and, plainly, because nothing is without connection. The institutions of men, the relations in which they stand to each other, whether in families or as members of a political society,---the operation of their passions and propensities as individuals, and their progress as such through life,—the arts and inventions which have ennobled our race, or redeemed it from barbarism,---whatever, in short, has been done, or suffered, or contemplated by mankind, in any age or country,—even the abstractions of the understanding, and the visionary creatures of the imagination, are all to be regarded as harmonizing with an established economy, every department of which is alike pervaded by the influence of the grand designer of the whole. Now, as it is the labour of the philosopher to explore the causes of things, and to discover their connections, it is the province of the historian to narrate the result of his inquiries and discoveries. Every thing, therefore, which employs the one may furnish materials for the other; or, to express the same sense somewhat differently, history is that branch of philosophy which records the series and dependencies of ascertained truths.

These remarks being well understood, there will appear little reason for entering upon a long, and, after all, an imperfect enumeration of the subjects of this interesting science. It is enough to say, what has been already implied, that it comprehends in its range every topic on which research may be bestowed, experiment instituted, or ingenuity exercised; and hence the almost invariable addition of an introductory memoir, accompanying reference to facts and dates, or other expository narrative, to treatises on the sciences, descriptions of kingdoms and people, illustrations of human life and character, the most superficial survey of a visible object, and the profoundest investigations of metaphysical mysteries. In a word, all that is requisite to constitute a subject or to furnish a material for history, is the discovery of the relation of an object to time and to other objects.

SECT. II. *Chronology.*

This leads us to consider what has generally and properly enough been denominated one of the elements of history, namely, chronology, or that art the object of which is the computation of time. The importance of having certain definite marks or eras in the progress of time, to which reference may continually be made in the course of any inquiry into events, is so very obvious, and the difficulty of determining them so great, that we need not wonder at either the immense labour which numerous authors have expended on this topic, or those extraordinary discrepancies which are to be met with in their sentiments and conclusions respecting it. If any one should doubt for a moment the extreme value of correctness of chronology to the prosecution of history, let him reflect on what is implied in referring any particular event to a specific period of time. According to what has been mentioned, this is to bring it within the operation or influence, mutual and reciprocal, of all the facts and circumstances which existed, not only at that time, but also in the preceding periods. To commit an error here, therefore, is not simply to displace an event. It is virtually to assign causes for it and consequences to it with which it was unconnected, and thus essentially to vitiate and derange the entire system of phenomena. From our scanty acquaintance with the affairs of the earliest ages, we no doubt find it impossible to detect the injuries which an error of this kind must occasion; but our inability for the task is surely not a valid argument against the proposition, that these injuries may be of such an amount as to prove absolutely fatal to history. To us of the present day it is apparently quite immaterial, whether an event which concerned the antediluvian world occurred 400 or 1400 years before its destruction; but to the eyes of one who had perfect intelligence on the subject, the difference would seem of such consequence, as to involve every feature, cause, and effect of the event. Suppose that some thousand years hence, and in the absence of authentic records, the invasion of England by William the Conqueror were referred to the period in which Augustus swayed the sceptre of Rome; Would it be possible for posterity to understand the real import and connexion of that incident in the manner in which we now do?—As-surely not. But every anachronism is similar in its bearings to this monstrous example; and though, perhaps, by no means so great in degree, would be found as fatal in the nature of its tendency if prosecuted to its consequences. It is with no little justice, then, that chronology has been styled the *eye* and even the *soul* of history; or that without it the subjects of this art could be considered no other than a dark chaos, a wreck of fragments, void of order and every other indication of design.

Unfortunately, the discordancies of chronologers, in cases of the highest consequence, are as enormous as the difference between the truth and the supposition above mentioned; and hence the comparatively little value, as to any philosophical purpose, of the generality of histories respecting the earliest times. Examples may be given in the cases of the most important and governing eras or epochs, as those of the creation of the world, the deluge, the Exodus of the Israelites from Egypt, the destruction of Troy, the foundation of Solomon's temple, the foundation of Rome, the destruction of Nineveh, and the nativity of Christ. Besides displaying the amazing differences of authors as to some of these points, it is proper to give a condensed view of the various systems of chronology, with some remarks on the merits of their respective founders and advocates. This will necessarily exhibit the elements of that subsidiary art.

A *day* is the most obvious, and was certainly the earliest measure of time. But the word is used in two senses; first, as denoting only that period in which the sun is above the horizon, called the natural day,—as the period when that luminary is below the horizon has been called the natural night; and again, as the portion of time comprehending both these periods, or the duration between the two presentations of the same meridian to the sun, and denominated the civil or calendar day, which corresponds with the solar day of the astronomers. In speaking of this compound period, it is remarkable that Moses makes the natural night to precede the natural day; and hence he says, "the evening and the morning were the first, second, &c. day." This usage is followed by the Jews, and seems to have been adopted by several other people, who begin their day at evening twilight. But most of the nations of Europe reckon their civil day from midnight to midnight. The natural day was early divided into morning, noon, and evening; as the natural night was into three parts, denominated the first watch or beginning of watches, the second or middle watch, and the third, last, or morning watch,—to which was afterwards added, especially among the Grecians and Romans, from the latter of whom, probably, the Jews derived it about the time of Christ—a fourth watch. Another division of the natural day and the natural night, namely, into 12 hours each, reckoned separately, is also very ancient; but, in place of it, some people have divided the civil day into 24 equal portions reckoned consecutively.

The computation of time by *weeks*, consisting of seven days, is undoubtedly of very early origin, and seems to be connected with the institution of the seventh day as a day of rest from labour. Some writers have imagined the week to be a natural measure of time, indicated by the four quarters of the moon; but this is rather an ingenious than a likely theory. The Hebrew word for *seven* signifies fulness; and this number was accordingly considered by the Jews as the number of completion or sufficiency. They were followed in this division of time by probably every ancient people, though the observance of the sabbath was not constant among them,—a fact so extraordinary, as not to be accounted for, in the absence of any natural reasons, except on the supposition of the universality of the tradition respecting the formation of the world. Originally the days of the week appear to have been merely numbered from the first to the last; but the Gentiles, after losing or corrupting their knowledge of the patriarchal religion, dedicated them to the heavenly bodies, or some imaginary beings, considered as objects of worship. This practice has been ascribed to the ancient Egyptians as its inventors; and from them it is thought to have spread rapidly among other nations. The names generally used in Europe are derived from the Saxon or Gothic mythology, no small portion of which has affinity with that of the most ancient times, and is to be traced to Asia. Thus we have *Sun*day and *Mon*day, from the two great luminaries; *Tues*day from *Tuisco*, a warlike deity; *Wednes*day from *Odin*, or *Wodin*, the chief god of the Scandinavians, and imagined to be the same as the Hermes or Thoth of the Egyptians and Grecians, as well as the Boodha or Budha of the Hindoos, B,V,W, being easily convertible letters; *Thurs*day from Thor, the thunderer, or Jove of the Scandinavians, and probably the *Taranis* of the Celts; *Fri*day from *Frea* or *Freya* his wife, or rather the Scandinavian Venus, which assimilates our name of the day with the *dies Veneris* of the classics; and, lastly, *Satur*day, from *Sater*, *Saturn*.

A *month* is a measure of time, of the derivation of which, from the revolution of the moon, there can be no doubt. Our name for it, or the Saxon *monat*, obviously implies this origin; and the same remark may be made as to its denomination in some of the ancient languages. Thus the Greek word signifying a month, is related to the word in the same language denoting the moon; from it was taken the *mensis* of the Romans; and the Hebrew word for month refers to the same luminary. As a lunation was supposed to occupy thirty days, the civil or calendar month originally consisted of that number among several ancient nations; but as, in course of time, it was observed that a lunation, in place of comprehending that period, was perfected in about 29½ days, the practice was pretty generally adopted of reckoning the months alternately 29 and 30 days. The common mode of distinguishing them at first seems to have been by numbers, like that of the primitive week, and this is understood to be still retained by the Chinese. Afterwards distinct names were given to them, in honour of certain real or supposed personages, or as memorials of remarkable events and circumstances. Thus the Hebrew months were at first distinguished merely by their order; but subsequently they obtained appellations, as *Abib* and *Nizan*, both given to the first month, the former signifying *green*, or green ear of corn, the latter *flight*; alluding to the departure from Egypt; the second month was called *Zif*, a word denoting *glory* or *splendour*, and probably employed to honour the month in which Solomon's temple was founded; the third *Sivan*, signifying *bramble*; the fourth *Thamuz* or *Tamuz*, from the idol so styled; the fifth *Ab*, apparently from the same root as Abib; the sixth *Elul*, denoting *mourning*, and perhaps employed to designate the time or preparation for the day of atonement, which was on the 10th of the seventh month, called *Ethanim*, signifying *harvests*; the eighth month, *Bul*, from a word denoting to *wear away* or *consume*, alluding to the decay of vegetation; the ninth *Chisleu*, signifying *chilled*; the tenth *Tebeth*, or *miry*; the eleventh *Shebat*, a word meaning *sceptre* or *staff*; and the twelfth *Adar*, a *splendid* or *magnificent mantle*, probably pointing out the rich garb which the earth begins to assume at that season in eastern countries, namely, what corresponds to part of our February. In some years a thirteenth month was added, named *Veadar*, or the second *Adar*. The Syrian and Arabian months corresponded pretty generally with the Hebrew, as did a few of the Egyptian and Persian. Among the Greeks the months generally received their names from the festivals which happened to be held in them; and, as these were connected with their religion, the remark already made applies to them likewise. As to the Romans, from whom the names of the months now used throughout Europe were derived, it is enough to say, that they retained in part the primitive mode of designating them by numbers, as is apparent in four of the titles now in use,—*September*, *October*, *November*, and *December*.

Originally, and probably almost universally, for many ages, the period of time which we call *year* consisted of 360 days; though the beginning of it was somewhat different with different nations. Thus the Egyptians and the Jews commenced their civil year about the autumnal equinox; the Chaldæans, Persians, and Syrians about the vernal equinox; which was also the case with the Romans, till the time of Numa, when they began the year about the winter solstice. How early it was discovered that the year, which had been calculated to consist of 360 days, did not occupy the whole period of the tropical or solar year, but was defective at least five days, it is impossible to determine; but proofs are to be met with of its being known in very ancient times. The farther rectification of the period, by the addition of six hours, is claimed by the Egyptian priests, though it was not introduced by them, in the manner of intercalation, into their vulgar computation of time. The Greeks long retained the primitive year of 360 days, and adopted a variety of rather clumsy methods for correcting the difference between it and the duration of the sun's course. With the early Romans the year consisted of ten months which had names, and two intercalary months which were originally without names, though afterwards called Januarius and Februarius; but, these together, besides making up no more than 360 days, were very different in respect of magnitude or duration. Thus, September had only 16 days, May 22, one of the anonymous 23, June 26, Sextilis 28, November 30, the other anonymous 33, December 35, April, March, and Quintilis 36, and October 39. Romulus introduced an improvement, by which they were brought nearer to equality, none of them being less than 23, and none exceeding 31 days. Numa made farther alterations, especially by substituting the lunar year in place of the solar year; but as the former is less by 11 days than the latter, he intercalated a month of 22 days at the end of every second year, after the 23d day of the second anonymous month. He is entitled to great credit for his sagacity in reforming the calendar, though his arrangements were not quite unexceptionable, which, indeed, is no way to be wondered at considering the period of his reign. The decemvirs made some slight changes in his plan; but notwithstanding these important attempts at a correct computation, much remained to be done by Julius Cæsar, to whom the world is indebted for one of the greatest improvements in this important subject. Into the particulars of it there is no occasion to enter at present. Suffice it, then, to say that, in consequence of his plan, and its modification by Pope Gregory XIII., the calendar was rendered correct enough as to all ordinary purposes for 6000 years, when a farther rectification will be needed. This reformed Julian year, or, as it is also called, the Gregorian year, was adopted in England in 1751, and, with the exception of Russia, is in use throughout Europe.

Of the *cycles*, or recurrent periods of years, used in chronology, the most noted are those of the moon and the sun, to which may be added the Julian period.

The cycle of the moon was invented by Meton, about 430 years before the Christian era, for the purpose of bringing the lunar year into conformity with the solar, the former of which is 11 days shorter than the latter. Meton's principle was that of intercalating seven lunations in 19 lunar years, by which means they were brought to a tolerably near correspondence with as many solar years. Its chief imperfection arose from the circumstance of there being sometimes five leap-years and sometimes only four in 19 years, so that a rectification of the cycle was found necessary by extending it to 76 years, in which time there are exactly 19 leap-years. This was proposed by Calippus, from whom it obtained the name of the Calippic period. Even this would require correction after 310 years, in which time the difference between 235 lunations and 19 Julian years, being very nearly an hour and a half, amounts to a whole day.

The cycle of the sun is the period of 28 years, at the end of which time the year commences on the same day of the week with which it commenced at the beginning of that period. This cycle would consist only of seven years, if the year never contained more than 52 weeks and one day,—in which case the eighth year would commence with the same day as the first. But this order is broken by the occurrence of *leap* year every fourth year, when there are two days over the 52 weeks. The cycle of the sun, therefore, must be formed by the multiplication of 4 with 7, or is equal to 28 years.

The Julian period is a remarkable and highly celebrated cycle, invented by Scaliger, who, however, erred as to its time of beginning. It is formed by the continued multiplication of the cycles of the sun and moon and that of the indiction,—which last is a cycle of 15 years used by the Romans for the purpose of regulating the times of certain taxes. Now, as the numbers of years comprehended in these three cycles are respectively 28, 19, and 15, the Julian period consists of 7980 years. Its commencement occurred in 4714, B. C., when the cycles of which it is made up were all in their first year; and the end of it will be in 3266, A. D., when, and not before, these three cycles will again correspond in the same manner. The use of the Julian period in history would be attended with considerable difficulties; and it has no advantages equal to those of a fixed era, as that of the vulgar computation known by the name of the Year of the Lord.

Of eclipses and the precession of the equinoxes, to which reference is frequently made in chronological discussions, we had occasion to speak sufficiently in the article ASTRONOMY.

Two subsidiary modes of computing periods of time, namely, *generations* and *reigns*, have been employed by both sacred and profane historians, and are deserving of some notice.

By a *generation* is meant the interval of time between the birth of an individual and that of his son. This is obviously variable, accordingly as we reckon the youngest, the oldest, or any one of the intermediate of his sons; and it depends also on the duration of human life, and other circumstances. No correct and perfectly unexceptionable calculation can, therefore, be built on this basis; yet it is occasionally useful, especially in the absence of direct information respecting the precise time of any event. The average of generations may no doubt be different at different times and in different countries; but it probably always bears a certain, or, at least, a tolerably regular proportion to the duration of life. Could this point be ascertained, then, we should be furnished with a principle from which, in some measure, to judge of several controverted questions of high consequence in chronology. The mean length of a generation, as now and for a long time commonly admitted, is 33 years; and this agrees well both with the computations of some of the ancients and the observations of recent inquirers into the subject.

The lengths of the *reigns* of kings are still more variable, as will readily be imagined, than those of generations; yet these, too, have been used somewhat extensively in order to settle the times of events. The average of reigns is shorter than that of generations, and for good reasons. Kings are occasionally succeeded, not by their sons, but by their brothers or other relations, who may happen to be nearly equal in age, or, in some cases, actually of greater age than their own; and, moreover, they are sometimes deposed or put to death, by which means a diminution of the duration of reigns is produced. Dr Hales, in his valuable System of Chronology, gives a list of ten cases of reigns, which have been very carefully investigated, and from which, therefore, it may be safe to deduce an average.

The first is that of 59 Egyptian kings, who reigned in all 1299 years, giving 22 years a-piece.

The second is that of 30 Athenian kings, the amount of whose reigns is 804 years, or $26\frac{2}{3}$ a-piece.

The third, that of kings of Lydia and Argon, affords nearly 23 years a-piece.

The fourth, the 18 kings of Judah, beginning from Rehoboam 990 B. C. and ending with Zedekiah 586 B. C. in all 404 years, gives $22\frac{4}{9}$ years a-piece.

The fifth comprehends 31 kings of England, from William the Conqueror in 1066 A. D. to the end of George II. in 1760, being 694 years, which is at the rate of $22\frac{2}{3}$ to each.

The sixth is of the kings of Scotland, from Malcolm I. in 938 A. D. to the end of James I. in England, in 1625, being 687 years, or nearly 21 to each.

The seventh, or 32 kings of France, from Hugh Capet in 987 A. D. to the end of Louis XVI. in 793, 806 years, at the rate of 25 each.

The eighth, of kings of Spain, 32 in number, from Ferdinand the Great in 1027 A. D. to Charles III. in 1788, being 761 years, which gives nearly 24 a piece.

The ninth is that of the 55 emperors of Germany, from Charlemagne 800 A. D. to end of Leopold II. in 1792, being 992 years, which is at the rate of only 18 each.

The tenth relates to Hindostan, the Brahmins of which reckon 142 modern reigns in 3153 years, being nearly $22\frac{1}{2}$ to each.

From a comparison of these ten cases, it appears that the average of reigns is $22\frac{1}{3}$ years, in a series of 454 kings, in 10105 years; and on these data, therefore, the proportion of reigns to generations is as $22\frac{1}{3}$ to $33\frac{1}{3}$, or nearly as 2 to 3.

By the term *epoch*, a Greek word signifying "a stop," is now generally understood in chronology a remarkable date, as that of the deluge; while the term *era*, which is of Spanish origin, denotes an indefinite series of years beginning from some epoch; as the term *period*, again, designates a definite series. But these three terms are often employed as if they were synonymous, or nearly so. Of their importance as fixed points, to which events are to be referred, we have already spoken; and it now remains both to specify those which have been found most useful, and to enumerate the plans or systems of chronology by which they have been determined.

1. The first epoch to which we shall attend is that of the creation of the world. Here the differences of various authorities are truly astonishing, as is shown by Dr Hales, who has given a table of no less than 127 statements or decisions on the subject. Nor is this number, great as it is, and it might have been increased to 300, so extraordinary as the amount of the difference between them. Thus, the first, that of Alphonsus, king of Castile, who gives the longest existence to the world, determines the creation to have taken place in 6984, that is, nearly 7000 years before the Christian era; whereas the last in the list, that of Rabbi Lippman, gives it little more than half that antiquity, stating the creation to have been in 3616 B. C.,—the former exceeding the latter therefore by 3368 years. Nine of the decisions, beginning with that of Alphonsus, and ending with that

of Suidas, lie between the first mentioned date and the year 6000 B. C.; between this last date and that of 5000 B. C., the decisions are upwards of forty in number; those between 5000 and 4000 B. C. are about 36; and the remaining decisions run between this last date and that of Rabbi Lippman, in 3616 B. C., above noticed.

2. The second grand epoch is that of the deluge, respecting which the contrariety of opinions, though of course it cannot be so great absolutely, is still more singular and perplexing. Thus, among 15 authorities, selected out of an immense number, the extremes differ no less than 1142 years,—the Septuagint version, which stands at the head of the list, assigning the event to 3246 B. C., and that of the vulgar Jewish computation to 2104 B. C. The statement of archbishop Usher, which lies nearly intermediate between these extremes, namely, 2348 B. C., and which has found its way into the margins of our common English bibles, is now discredited by several of the best chronologists, some of whom prefer that of the Samaritan text, which places the epoch in 2998, or nearly 3000 B. C., while Dr Hales carries it still higher, namely, to 3155.

3. The epoch of the Exodus of the Israelites from Egypt, is, in like manner, very differently stated. Thus, Josephus, with whom Dr Hales agrees, assigns it to 1648 B. C., while, not to mention all the authothorities, Usher, whom the English bible follows, places it in 1491, and the vulgar Jewish chronology in 1312,—the difference between the first and the last being 336 years.

4. The opinions respecting the time of the reign of Sesostris, considered by historians as an interesting epoch, are still more at variance. Thus Playfair marks it at 1555 B. C., Usher at 1489, Hales at 1308, Sir Isaac Newton at 974; and, still lower, Sir John Marsham fixes it at 967,—the difference between the first and the last being nearly 600 years.

5. The epoch of the destruction of Troy has been diversely arranged between 1270 and 904 B. C.,—a discrepancy of 366 years.

6. On the subject of the period from the Exodus of the Israelites to the foundation of Solomon's temple, the extremes of the decisions differ 262 years,—the highest date being that of 741 B. C., and the lowest 479.

7. As to the epoch of the foundation of Rome, the difference of the extremes of the theories amounts to 126 years; a great number of authorities assigning it to 753, B. C., whereas Newton ascribes it to 627.

8. The time of the overthrow of Nineveh,—another remarkable epoch, has been still more variously stated, from 896, B. C. to only 596,—a difference of 300 years. Drs Blair, Playfair, and Hales, with other authors, agree in allotting this event to 606 B. C.

9. The grand epoch of the Nativity, a still more recent event, and one about which it might have been thought there would prevail no contrariety of opinion among those who felt interested in it, has nevertheless been ascribed to ten different years,—between 747, reckoning from the foundation of Rome, and 756, both included. The common and received computation on this subject, or vulgar Christian era, was invented in 532, A. D. by Dionysius Exiguus, a native of Scythia, but a Roman abbot, who by mistake, as is generally admitted, assigned the birth of the Redeemer to the year 753, reckoning from the foundation of Rome; whereas this great event can be much more probably shown to have occurred about five years earlier, namely, in 749, U. C.

It is now time to make some observations on the merits of the chief chronological systems, with a view to determine their claims to authority. We shall confine ourselves almost entirely to those which may be thought to possess distinct and important peculiarities, as there could be no advantage in specifying merely minute differences of statement.

The first system which demands attention is that of the Jews, which has served as the basis whereon several authors of great note have raised a variety of structures. Under this head we comprehend not only the chronology of the Sacred Scriptures, but also the theories of uncanonical Jews; though, as will speedily be shown, the differences between them on certain points are of vital consequence.

To all who regard the Holy Scriptures as of divine authority, it must always seem a very serious question, What is to be received under that title? The answer necessarily involves many interesting particulars, and, of consequence, a good deal of research. Some of the topics to be investigated are the respective value of the manuscripts, the various editions of the original, and the numerous translations of it. It is self-evident that, as these do not all agree, they cannot all be received with equal confidence. An inquiry, therefore, is absolutely requisite into their history; and it becomes of the highest consequence to determine how the differences discernible in them originated. This belongs to the department of biblical criticism, and it has occupied the minds of the ablest men of modern times, in a manner protioned to its decided bearing on a subject of superlative moment to the human race. What we have at present to regard is only a portion, though by no means a trivial one, of this widely extended field.

The chronological statements of the Bible relative to some of the earliest ages of the world are not found to agree in the common or Masorete Hebrew edition, the Samaritan copy of the Pentateuch, and the Septuagint version; and the discordancy between them is sometimes of such a nature, and apparently so systematic, that it cannot be assigned to carelessness or accident, but must be allowed to bear marks of design. Is it possible to ascertain what this design was; to whom it ought to be imputed; to what extent it has operated; and by what means its operation can be counteracted? A brief solution of the difficulties now alluded to may not perhaps be judged irrelevant to our present purpose, and is aimed at in some of the following remarks. But let us premise an exposition of the amount of the discordancies for which we are to account. This will be given most satisfactorily in the form of tables, which are intended to exhibit the patriarchal genealogies according to the statements of the Masorete or common Hebrew text, the Samaritan copy, and the Septuagint version. In the first table, which contains the generations from Adam to Noah, namely ten in number, are given, in the first place, the names of the individuals; then three columns of numbers, pointing out, according to the different authorities, the ages of the fathers at the times of the births of their respective sons; next, the residues of the years of the fathers, that is, their duration after these births; and lastly, the amounts of these two numbers, or, in other words, the extent of their lives. The second table relates to the period between the deluge and the birth of Abraham, and is made up in the same manner; only the last column exhibits merely the statement of the Samaritan copy, which alone, except in the case of Terah, mentions the extent of the lives of the patriarchs.

TABLE I. *Patriarchal Genealogies before the Deluge.*

	Generations.			Residues.			Extent of Lives.		
	Heb.	Sam.	Sept.	Heb.	Sam.	Sept.	Heb.	Sam.	Sept.
1. ADAM	130	130	230	800	800	700	930	930	930
2. Seth	105	105	205	807	807	707	912	912	912
3. Enos	90	90	190	815	815	715	905	905	905
4. Cainan	70	70	170	840	840	740	910	910	910
5. Malaleel	65	65	165	830	830	730	895	895	895
6. Jared	162	62	162	800	785	800	962	847	962
7. Enoch	65	65	165	300	300	200	365	365	365
8. Methus.	187	67	187	782	653	782	969	720	969
9. Lamech	182	53	188	595	600	565	777	653	753
10. Noah	600	600	600						
DELUGE	1656	1307	2262						

TABLE II. *Patriarchal Genealogies after the Deluge.*

	Generations.			Residues.			Extent of Lives.		
	Heb.	Sam.	Sept.	Heb.	Sam.	Sept.	Heb.	Sam.	Sept.
1. DELUGE.									
Shem	2	2	2	500	500	500		600	
2. Arphax.	35	135	135	403	303	403		438	
(Cainan 2.			130)			330)			
3. Salah	30	130	130	403	303	303		433	
4. Eber.	34	134	134	430	270	270		404	
5. Phaleg	30	130	130	209	109	209		239	
6. Reu	32	132	132	207	107	207		239	
7. Serug	30	130	130	200	100	200		230	
8. Nahor	29	79	79	119	69	129		148	
9. Terah	70	70	70	135	75	135	205	145	205
Time of Abraham after the Deluge.	292	942	1072						
Time of Deluge after the creation	1656	1307	2262						
Total	1948	2249	3334						

From the first of these tables it appears, that tho', with some not very great nor numerous exceptions, the extent of the lives of the individuals is stated to be the same by the three different authorities, the generations and the residues vary considerably, and in several cases reciprocally. Thus, the age of Adam at the time of the birth of Seth is given in the Masorete and Samaritan Hebrew texts at 130 years, and the residue of his life in both is 800; so that the total of his years, according to them, is 930. With this amount the Septuagint version agrees; but it differs from these authorities precisely a century as to the generation of Adam, and, of consequence, as to the residue of his years—making the former 230 in place of 130, and the latter 700 in place of 800! A similar remark applies to the cases of Seth, Enos, Cainan, Malaleel, and Enoch; in all of which the Septuagint varies a century from the Masorete and Samaritan Hebrew, in respect of the relations between the generations and the residues, though it agrees with them as to the final amounts. There is here, therefore, a regular and a systematic difference on the subject of the patriarchal times; and it is of such a nature as necessarily to affect the period of the deluge. This fact is made apparent in the close of this table, where that event is ascribed to three different and materially distant times,—a discrepancy, it ought to be remarked, not altogether thus accounted for; because, by inspection it will be observed that there are minor and irregular variations among the authorities,—but which chiefly arises from the source now explained. The second table manifests something of the like kind,—a regular and very plainly discernible difference to the like amount between the authorities on the subject of the relation of the generations to the lives; but with this peculiarity, that the Samaritan text agrees throughout with the Septuagint in lengthening the generations by a century, though it does not equally and regularly agree with it in the statement respecting the residues, and therefore does not as to the final amount. Farther, in this table there is only one case, that of Nahor, in which there is a *minor* difference between the Masorete and the two other authorities; and in this case these two correspond. It follows, then, that the Samaritan text and the Septuagint version *would* agree as to the period of Abraham, though not as to subsequent periods, only, as is shewn in this table, the latter has interjected a second Cainan, in virtue of whose imputed generation, namely 130, their agreement as to this point is broken to that amount.

After this exposition of such regular differences between these three authorities, it would be desirable to ascertain, if possible, whether they always existed, and if not, at what time and in which of them they took place. Certainty may not be arrived at on these topics; but such a degree of probability respecting them is perhaps to be obtained, as ought to satisfy a fair inquirer. Now, without going over all the ground which has been explored with the view of eliciting the truth, it may be enough to state some of the results of investigation, and some of the considerations which are to be weighed, before pronouncing a judgment on the points at issue.

There is reason, then, to decide in the first place, that originally there did not exist any such material differences as have now been shewn to prevail between the three authorities; or, to limit the investigation, between the common Hebrew and Samaritan text on the one hand, and the Greek version or Septuagint on the other; and there are certain testimonies still extant, as to the general fidelity of this translation, which ought to be allowed much weight in deciding on its character. One of these testimonies is that of Josephus, who, besides what he says directly in reference to the Septuagint, almost invariably concurs with it as to the patriarchal genealogies. Admitting, therefore, that the three authorities were nearly agreed on this point in his days, and there is no evidence to the contrary, it follows that either the copies of his work, or of one, or more, or all of these authorities must have been altered since his time. Now, the reasons for thinking that the Hebrew copies might chiefly, if not solely, be subjected to these changes, are pretty powerful; whilst the grounds on which it is conjectured that they actually were subjected to them, seem very strongly to warrant such an opinion. On these topics it may not be unprofitable to condense some of the able observations of the author whose name has been already mentioned, Dr Hales.

The Hebrew scriptures were as liable to be adulterated as the Greek or any other version of them; and after the destruction of Jerusalem, and the consequent dispersion of the Jews, were probably even more so. Besides being less numerous, and confined almost solely to those persons who understood the original language, which was certainly much less cultivated than the Greek, there was no small temptation to vitiate them, in order to defeat or falsify the arguments of those who constantly appealed to them in confirmation of the Christian faith. The Septuagint was extensively accessible, from the language in which it was written; and it fell into the hands of many different people, who really could have no one common object that might induce even a wish to alter it, and who, if they had united in any general wish to that effect, would have found it impossible to accomplish the projected change without detection on the part of their enemies and persecutors. Moreover, the apostles and other early Christian writers frequently quote this version, a clear proof both of their regard for it and of its being in common use; and these two circumstances, to say nothing of their moral characters, are no small guarantee of the opinion that they would not attempt an imposition by it. A single instance of this kind would have proved most grateful to the Jews, who *latterly* hated the Septuagint version so much, as actually to institute a solemn fast for the purpose of desecrating its memory, and to set about the formation of three other Greek translations in opposition to it,—which new translations were modelled, so far as chronology was concerned, on the principle of a *shortened* computation, generally adopted, but in different degrees, by both the eastern and the western Jews. With their other supposed adulterations, or rather omissions, we have nothing to do in this place; but it is of some consequence to observe, that the Jews of this period were positively and directly charged with such practices,—as they were, indeed, with so great a degree of malignity towards Christianity, as would have induced them *to have burned their own scriptures* if they had previously known that their contents were to be triumphantly adduced as testimonies in its favour.

Now, a specific reason for their curtailing the patriarchal generations has been assigned. There long prevailed a tradition among them, and not only among them but also through much of the pagan world, that the SAVIOUR OF MANKIND, or, in the language of the Jews, the MESSIAH, was to appear in the course of the sixth millenary age,—an opinion, of the very general existence of which, on whatever it may have been founded, and whether or not it has been verified, it is impossible to doubt, in the face of the multiplied testimonies which have been and may be advanced in its illustration. That the Jews themselves participated in this opinion is well known from what is recorded in the New Testament of their expressions on the subject, and their great anxiety, after hearing of his miraculous works, to be assured, on what they thought the most satisfactory evidence, that the individual who bore the name of Jesus Christ was in reality their promised and expected Redeemer. But, as his appearance and his policy did not correspond with their preconceived notions as to what he was to be and to do, and as they consequently rejected his authority and his claims, whilst, whatever might have been their inclination, they saw it was impossible to obliterate the predictions to which the followers of that personage appealed,—it might seem to them expedient, probably as a pious fraud, or, at the worst, only a venial trespass, to modify the genealogy of the patriarchal age, in such a manner as should invalidate the conformity between the acknowledged tradition respecting the time of the coming of the Messiah, and the period in which the despised Christ lived upon the earth. Now it would have been absurd, and quite at variance with their present condition, as well as their past history, to have asserted that the prophecies relating to the Messiah's advent had been fulfilled several centuries *before* the time of this individual; and therefore it was most unlikely that they should lengthen out the past duration of the world so as to comprehend to that amount the age when the "desire of all nations" was to come: Whereas an alteration of the contrary nature, the diminution, by several centuries, of the patriarchal generations, would have the important effect of shewing that the present time was far short of the announced and expected period of his reign. This, then, was the principle on which, there is ground to believe, the Jews, subsequently to the days of Christ, ventured to disturb their sacred records, and from the influence of which they were accused of having falsified chronology. "The Jews," says Ephrem Syrus, who died A.D. 378, and who is quoted by Dr Hales, "The Jews have subtracted 600 years from the generations of Adam, Seth, &c. in order that their own books might not convict them concerning the coming of Christ; he having been predicted to appear for the deliverance of mankind after 5500 years." And, still more explicitly, says Abulfaragi, the Armenian annalist, also quoted by the same author, "It having been foretold in the law and the prophets concerning the MESSIAH, that he should be sent in *the last times*; and the earlier rabbins, finding no better device to reject (Jesus as) THE CHRIST, than to alter the generations of the patriarchs, *by which the age of the world might be* *known*, they subtracted a century from *Adam's* age until the birth of *Seth*, and added the same to his residue of life; and this they did in the line of the root of Adam's descendants down to *Abraham.* By this device, their computation shewed that (Jesus) Christ was manifested near the middle of the *fifth* millenary of the age of the world, which, according to them, was to last for 7000 years; and they said, *We are still in the middle of the time, and the time appointed for the MESSIAH's advent is not yet come.*" In which passage, as is noticed by Dr Hales, Abulfaragi reckons according to the eastern Jews, who dated the creation at 4220 B. C.; whereas the western Jews date it at 3760 B. C. and thus depress the birth of Jesus Christ still more, namely, to the middle of the *fourth* age.

Proofs of this extraordinary defalcation may be derived from various sources, as the concessions of the early Jewish writers themselves; very unequivocal symptoms in the arrangement of both the antediluvian and postdiluvian genealogies; general reasoning on the established laws and common course of nature; and the inconsistency between the shorter Hebrew computation and both sacred and profane history;—for the enumeration and illustration of all which topics, the reader is referred to the work of Dr Hales. Judging on these grounds, therefore, one is warranted to give the preference, as to this particular, to the Septuagint version, which appears to have followed an ancient and an uncorrupted Hebrew copy.

Generally speaking, the modern Jews have adopted a short computation in their chronology; but they are far from being agreed among themselves on the subject; and their management of the periods subsequent to the times now spoken of, manifests something of the same spirit that has just been exposed. In short, there are such evidences of their having vitiated what they themselves professed to hold in the highest esteem, that it would be quite imprudent to confide in their statements, where there are no other testimonies to produce conviction of their faith. Most unfortunately for chronology, some of the ablest men who have cultivated it, either not sufficiently aware of the little credit that is due to their opinions, or satisfying themselves with a persuasion of the absolute purity of the commonly received text of the Hebrew scriptures, have made the Jewish statements the basis of their own computations,--and thus, to a great degree, though unintentionally, vitiated nearly the whole of ancient history.

Among those to whom these remarks apply, the first to be mentioned are the illustrious Joseph Scaliger, and his scarcely less illustrious contemporary and rival Dionysius Petavius. These authors differ in sundry particulars, and the latter seems to have set himself earnestly to correct the errors of the former; but it is certain that they agree in adopting the essentials of the Jewish chronology, and in maintaining the verity of the Masorete text. Archbishop Usher, one of the greatest men and profoundest scholars which the church of Ireland has produced, though fully of opinion that the Hebrew copies of the Old Testament were no less liable to the errors of transcribers than those of the New, or indeed any other books, did not venture to travel far out of the track of his predecessors; and, accordingly, his system of chronology varies so little from theirs, that it has no distinct claim to notice, and most assuredly no title to have its date authoritatively impressed on the English translation of the Bible. "The system itself being radically defective," says Dr Hales, himself a clergyman of the church of which Usher was so great an ornament, "these dates must necessarily be erroneous, and ought therefore to be rectified, as furnishing a plausible ground of impeaching the veracity and credibility of Holy Writ to sceptics and infidels."

Sir Walter Raleigh, not mentioned by Dr Hales, exhibits a very useful and minute chronological table at the end of his History of the World. It agrees, in some measure, by no means thoroughly, with Scaliger's system; and adopts that author's Julian period, affirming it to exceed the years of the world by 682. Raleigh, therefore, who computes from both epochs, states the creation to have been in the year 683 of that period; whereas, according to Scaliger himself, the creation took place in 764 of the Julian period,—a still greater error. The difference between them, being 82, is maintained in their statements respecting the deluge, as computed by the Julian period,—that of Scaliger being 2420, and Raleigh's 2338. But it does not extend throughout the subsequent eras. For example, the Exodus occurred, according to Scaliger, in 3217 of the Julian period; but according to Raleigh in 3196,—a difference of 21 only. The latter allows 480 years complete between the Exodus and the foundation of Solomon's temple, which is one more than Scaliger's reckoning, and of consequence the difference is so much diminished as to the time of that event. It is reduced to 17 respecting the period of the destruction of the temple. Again, considering the rebuilding of the temple and the finishing the walls of Jerusalem as synonymous, it is no more than 11 as to that event; and, lastly, becomes no more than about 1, or, in other words, the difference vanishes, in their statements as to the period of Judas Maccabæus, beyond which Raleigh's tables do not extend.

Principal Baillie of Glasgow, whose work on Chronology was published at Amsterdam in 1663, adopts the short Hebrew computation, and generally defends the common Hebrew text against the Greek version; but, as to minor points, sometimes follows Scaliger, sometimes Petavius, and at other times varies from both, and apparently all other chronologers.

Sir John Marsham's System of Chronology does not vary in essentials from its predecessors.

Sir Isaac Newton spent many years of his valuable life in the cultivation of this science, though, unfortunately, he adopted an insecure foundation; so that his superstructure is not entitled to the deference that is due to his philosophical labours. His system bears some affinity to that of Petavius and other followers of the low computation; but, besides being liable to the objections which may be urged against their views, it is chargeable with sundry peculiar errors, which render it considerably worse than useless. These are minutely stated and commented on by Dr Hales, to whose work the curious reader is referred for them.

The chronology of Kennedy is chiefly remarkable for the arbitrariness of the principles on which it rests, and the apparent ingenuity with which astronomical tables and chronological computations are made to harmonize.

The late Principal Playfair, of St Andrew's, published a valuable work on this science in 1784. It is an improvement on some of its predecessors; but labours under the radical defects which have already been ascribed to the offspring of the Jewish falsification.

The late Lord Woodhouselee, in his Elements of General History, adopted the system of Usher.

In opposition to all these authorities is to be put the system of the Greek computation, supported by Josephus, and maintained among the moderns, but with various modifications, by such men as Isaac Vossius, Whiston, Kennicott, Jackson, and Hales. In place of particularizing the opinions and specific differences of these authors, it may be advisable to exhibit in a tabular form six of the chief epochs as determined by them; so that a satisfactory comparison may be made between the opposite systems. As, for this purpose, it is not necessary to enumerate every individual author of whom mention has already been made, we shall confine ourselves to three of each, namely, the vulgar Jewish system, that of Usher, and that of Playfair, on the one side; and those of Josephus, Hales, and Jackson on the other. All the epochs are reckoned backwards from the Christian era.

	Vulgar Jewish System.	Usher.	Playfair.	Joseph.	Hales.	Jackson.
Adam created.	3760	4004	4008	5402	5411	5426
Deluge	2104	2348	2352	3146	3155	3170
Abrah. born.	1812	1996	2060	2153	2153	2098
Exodus	1312	1491	1555	1648	1648	1593
Temple founded	832	1012	1015	1027	1027	1014
Destroyed	422	588	588	586	586	586

In order to the improvement of this art, Dr Hales lays down *five rules of chronologizing*, suggested by Newton's *rules of philosophizing*. They may be briefly noticed, as preparatory to the succeeding table of Epochs.

Rule 1.—*To adhere to the scriptural standard.* The writings of Moses are beyond all question the oldest records extant, and are otherwise entitled to the highest regard in matters of history, as well as in points of faith. Their chronology, therefore, when rightly ascertained and understood, is the best light we can have in exploring the order and periods of former events; and the consequence of neglecting this rule has been most injurious to various systems of chronology.

Rule 2.—*To begin with the analytical method, and end with the synthetical.* By this is meant the mode of proceeding, first, from near and more certain times to remote and less certain, till some cardinal points are determined, and consequently assumed as principles, from which, in the second place, subordinate and intermediate dates are to be deduced. In this manner, for example, Dr Hales constructed his work in reference to one elementary date, namely, the birth of Cyrus, 599 B. C., as from that event may be ascertained the time of the accession of that prince to the throne of Persia, namely, 559 B. C.; to that of Media, 551 B. C.; and to that of Babylonia, 536 B. C.: whence the chronology of these kingdoms branches off; and from the last of which, in particular, the destruction of Solomon's temple by Nebuchadnezzar may be determined to 586 B. C.; from which, again, the time of the foundation of the temple is ascertained to have been 1027 B. C.; the Exodus to have taken place 1648 B. C.; the birth of Abraham 2153 B. C.; the reign of Nimrod 2554 B. C.; the deluge 3155 B. C.; and the creation 5411 B. C.

Rule 3.—*Not to adopt any date that is repugnant to any other established date.* The propriety and force of this canon are so obvious as to require no explanation. It is enough to give an instance of its transgression. " The generally received date of the destruction of Solomon's temple, namely, 588 B. C. is inconsistent with the true and only date of Nebuchadnezzar's reign, 604 B. C. as established and verified by Ptolemy's scientific canon; by the application of which, the unfounded hypothesis of a double commencement of his reign, during his father's life and after his death, is discarded."

Rule 5.—*Never to form an hypothesis, nor to assign a conjectural date, except in cases of absolute necessity.* The violation of this rule is so common a feature in chronological systems, as to have brought them into much contempt with intelligent persons.

Rule 4.—*Carefully and critically to distinguish between different persons in different ages and countries called by the same name; and, on the other hand, to unite or identify persons bearing different names in different authors, or at different times of their lives.* This rule is abundantly perspicuous, and needs no comment; but the exercise of it, so essential to success in this science, requires an amount of research, a power of judgment, and a degree of caution, which will not often be met with in those who either cultivate or despise chronology.

Whoever considers the importance and substantial necessity of these or some equivalent rules, will be at no loss to appreciate the extravagant pretensions of Hindoo and Chinese writers, to which certain individuals of high literary and scientific character in our own country have paid a most unworthy and discreditable deference. The impositions of the modern Brahmins appear to have met with an astonishing aptness of credulity, when even a very moderate degree of faith in what deserves the highest and most implicit confidence, would have been thought an incumbrance rather than a suitable ally to the philosophical character. But rejecting these impositions entirely, as alike irrational and unfounded, it is proper to remark, that the early Hindoos were so far attentive to chronology, as, by a very ancient writer, to have been named with the Jews as the only people who had a just conception of the creation of the world and of the beginning of things. Such is the testimony of Megasthenes, a

Eras and Events.

native of Persia, who resided for some time at the court of Porus, and of whose history of Indian affairs there unfortunately remains but a fragment in Clemens Alexandrinus. According to him, they did not go farther back than 5042, or, as some copies have it, 6042 years, and three months, from the invasion of India by Alexander. Now, dating that event at 327 B. C., and taking the former to be the correct reading, as agreeing better with the Mosaic record, their earliest era is 5369 B. C. which is only 42 years short of what we are inclined to consider the rectified era of the creation, namely, 5411 B. C. The eras of the modern Brahmins, it is well known, vastly exceed this antiquity; but, in reality, they are either altogether imaginary, or mere astronomical cycles, formed in the manner of the Julian period, by retrospective calculations. It is worthy of note, that what is called by Hindoo astronomers the *Cali yuga*, or last age of the world, is said by them to have commenced at a period which nearly corresponds with that of the deluge; though the historians of the same people differ from them and from one another in their statements respecting it.

Some early supposed astronomical eras of the Chinese are nearly in the same predicament with those of the Brahmins. If they are any thing like truth, which indeed is rarely the case, they are the result of *post* calculations; and there lies an insuperable argument against them, in the circumstances of their being so vastly earlier than the acknowledged time when eclipses began to be recorded in the annals of this people, and the omission of all notices respecting these phenomena, which, it is demonstrable, had occurred in the intermediate period.

SECT. III. *Eras and Events.*

Having thus very generally shewn what is purposed in chronology, the difficulties it has to encounter, and the errors to which an erroneous system of it may lead, as well as the mode by which it is to be prosecuted, it may be proper to give a few tables of remarkable eras and events, to which reference may be conveniently made in the perusal of works on history.

Remarkable Eras.

	B. C.
Creation of the world,	5411
Julian period,	4714
Deluge,	3155
Cali yuga, Indian era of deluge,	3102
Dispersion of mankind,	2614
Nimrod reigns in Assyria,	2554
Menes reigns in Egypt,	2412
Chinese empire divided into 12 provinces,	2277
Birth of Abraham,	2153
Israelites settle in Egypt,	1863
Exodus of Israelites,	1648
Cecrops reigns at Athens,	1558
Sesostris reigns in Egypt,	1308
Troy destroyed,	1184
Solomon's temple founded,	1027
Iphitus king of Elis,	884
Vulgar era of Olympiads, which end in 25 A. D. being the 201st,	776
Foundation of Rome,	753
Nabonassar, king of Babylon,	747
Seleucidae, Alexander's successors,	312
Era *Cæsaria*, at Antioch	49
Era *Juliana*	46
Era *Hispanica*,	38
Era *Actiaca*,	30
	A. D.
Vulgar Christian era,	1
Era of *Dioclesian* or *martyrs*,	284
Era of *Yesdegird*,	632
Hegira, or Mahommed's flight,	622
Era *Gelalœa*,	1074
Era of the reformation in England, (Wickliffe)	1360
in Bohemia, (Huss)	1405
in Germany, (Luther)	1517
in Switzerland, (Zuinglius)	1519
in Denmark,	1521
in France, (Calvin)	1529
in Sweden, (Petri)	1530
in Ireland, (Brown)	1535
in England completed, (Cranmer, &c.)	1547
in Scotland, (Knox)	1560
in Netherlands,	1566

Eras and Events.

Among the relics of antiquity purchased in Greece and the neighbouring countries for the earl of Arundel, about the beginning of the 17th century, are the celebrated marbles denominated after his lordship, and now deposited in the university of Oxford. The most important of these is unquestionably that tablet which contains what has generally been called the *Parian Chronicle*, from the circumstance of the marble having probably been originally found in the island of Paros. It seems to have been imperfect when first made known to the literary world, and subsequently suffered injury to a considerable amount. But, fortunately, the chief of its contents have been preserved, and they are of sufficient importance to chronology to deserve distinct notice. The following table exhibits the essence of several of its statements, rectified according to the chronological system of Dr Hales.

	B. C.
Cecrops, first king of Athens, began to reign,	1558
Deucalion reigns in Lycoria, near Parnassus, in the 9th year of Cecrops,	1549
Trial of Mars at the Areopagus for killing Halirrhotius the son of Neptune,	1507
Deucalion's flood, flight to Athens, and sacrifice,	1504
The Amphictyons collected by Amphictyon son of Deucalion, and their assembly at Thermopylæ	1497
Hellen, son of Deucalion, begins to reign in Phthiotis; and the Greeks, formerly called Graikoi, named Hellenus after him,	1496
Cadmus, son of Agenor, came from Phœnicia, and built a citadel (the Cadmea) at Thebes,	1494
Eurotas and Lacedæmon reign in Laconia,	1491
Flight of Danaus and his fifty daughters from Egypt to Lyndus in Rhodes,	1486
Ericthonius, king of Athens, institutes the chariot-race at the first celebration of the Panathenean games, in the 9th year of his reign,	1481

Eras and Events.	B.C.
Minos the First reigns in Crete, and iron found there by the Dactyli,	1407
Ceres teaches the sowing of corn at Athens, and Triptolemus, son of Celeus and Neæra, at Eleusis,	1384
Orpheus published his poem on the rape of Proserpine and the search of Ceres,	1374
The Lustration first instituted,	1301
A tribute of youth and virgins imposed on the Athenians, according to the oracle, by Minos the Second, king of Crete	1270
Theseus collected the inhabitants of Attica to Athens, and instituted a popular government,	1234
The Nemean games instituted at Athens in the 10th year of Theseus,	1226
The expedition of the Greeks against Troy,	1193
Troy taken by the Greeks,	1184
Teucer founds Salamis in Cyprus	1177
Athenian colonies planted at Ephesus, Erythræ, Clazomenæ, &c. in Ionia, by Neleus and others,	1043
Hesiod the poet flourished,	919
Homer the poet flourished,	884
Phidon, king of the Argives, coined silver money at Ægina,	870
Grecian colonies planted in Sicily by Archias the Corinthian,	758
Creon the first of the annual archons,	684
Terpander, son of Derdeneus, reformed the music of the ancients,	645
Sappho fled from Mitylene to Sicily	592
The Amphictyons conquered, and the Gymnastic games were celebrated,	591
Pisistratus became tyrant at Athens	561
Crœsus sent ambassadors to Delphi	556
Cyrus took Sardis, and made Crœsus prisoner,	548
Thespis the poet, who first exhibited tragedy, flourished,	537
Darius reigned over the Persians,	520
Harmodius and Aristogeiton slew Hipparchus, son of Pisistratus, tyrant of Athens; and conspiracy of Athenians against the Pisistratidæ,	512
Temple of Minerva Hippia built at Athens,	495
Battle of Marathon,	491
Xerxes, son of Darius, begins his reign,	490
Æschylus, the poet, gained the victory in tragedy; and Euripides, the poet, born,	486
Xerxes made his bridge of boats on the Hellespont; and the battle of Thermopylæ,	481
Battle of Platæa,	480
Hiero became tyrant of Syracuse,	472
Sophocles, the poet, gained the victory in tragedy, being 28 years of age,	470
Perdiccas reigned over the Macedonians,	462
Euripides, the poet, gained the victory in tragedy in the 43d year of his age. Contemporary with him were Socrates and Anaxagoras,	443
Dionysius became tyrant of Syracuse,	408
Cyrus the younger went up into Persia against his brother, who overcame him in the battle of Cunaxa,	406
Return of the Greeks under Xenophon, who had gone up with Cyrus; and the death of Socrates,	400
The battle of Leuctra,	371
The Phoceans plundered the temple of Delphi,	358
Alexander the Great born; Aristotle then living, and Callistratus being archon at Athens,	355

The next table which it is thought proper to give, relates to Roman history, from the foundation of the city to the end of the Eastern empire.

B. C.	Kings.	
754	Romulus.	
716	Numa Pompilius.	
673	Tullus Hostilius.	
641	Ancus Martius.	
617	Tarquinius Priscus.	
579	Servius Tullus.	
538	Tarquinius Superbus	
509	Republic.	
	Emperors.	
30	Augustus.	The 12 Cæsars.
A.D.		
14	Tiberius.	
36	Caius Caligula.	
40	Claudius.	
54	Nero.	
68	Vespasian.	
78	Titus.	
81	Domitian.	
96	Nerva.	
97	Trajan.	
116	Adrian.	
137	Antoninus Pius.	
161	Marcus Aurelius.	
180	Commodus.	
193	Pertinax.	
194	Septimius Severus.	
211	Caracalla.	
217	Opilius Macrinus.	
218	Heliogabalus.	
222	Alexander Severus.	
235	Two Gordians.	
238	Gordian, junior.	
243	Philip the Arabian.	
249	Decius.	
251	Gallus Hostilius.	
253	Valerian & Gallienus	
268	Claudius.	
270	Aurelian.	
275	Tacitus and Florian.	
276	Probus.	
282	Carus.	
283	Diocletian.	
305	Constantius Chlorus.	
306	Constantine the Great.	
337	Constantine II.	
341	Constantius alone.	
361	Julian the Apostate.	
363	Jovian.	
364	*Partition of the Empire.*	
	Eastern Emperors.	
364	Valens.	
B. C. 379	Theodosius the Great.	
395	Arcadius.	
408	Theodosius II.	
450	Marcianus.	
457	Leo.	
474	Leo II.	
476	*End of the Western Empire.*	
491	Anastasius.	
518	Justin.	
527	Justinian.	
565	Justin II.	
578	Tiberius.	
582	Mauricius.	
602	Phocas.	
610	Heraclius.	
641	Constans II.	
668	Constantine III.	
685	Justinian II.	
694	Leontius.	
697	Apsimar, or Tiberius.	
704	Justinian II. again.	
711	Philippicus.	
713	Anastasius II.	
715	Theodosius III.	
717	Leo III.	
741	Constantine IV.	
775	Leo IV.	
780	Constantine V.	
797	Irene.	
802	Nicephorus.	
811	Michael.	
813	Leo V.	
821	Michael II.	
829	Theophilus.	
842	Michael III.	
867	Basilius.	
886	Leo VI.	
910	Alexander.	
911	Constantine VI.	
960	Romanus.	
963	Nicephorus II.	
969	John Zimisces.	
976	Basilius II.	
1026	Constantine VII.	
1028	Romanus II.	
1034	Michael IV.	
1041	Michael V.	
1042	Constantine VIII.	
1054	Theodora.	
1057	Isaac Comnenus.	
1059	Constantine IX.	
1068	Romanus III.	
1071	Michael VI.	
1078	Alexius Comnenus.	

B. C.	
1115	Nicephorus III.
1118	John Comnenus.
1143	Manuel Comnenus.
1180	Alexius Comnenus II.
1183	Andronicus.
1185	Isaac Angelus.
1194	Alexius III.

Emperors of Nice.

1204	Theodore Lascaris.
1222	John Ducas.
1255	Theodore II.

B. C.	
1258	John Lascaris.
1259	Michael Paleologus.
1283	Andronicus II.
1320	Andronicus III.
1341	John Paleologus.
1391	ManuelPaleologus.
1424	John Paleologus II.
1448	Constantine Paleologus.
1453	*End of the Eastern Empire.*

The following table will be found very useful in reading ancient history, both sacred and profane. It is chiefly taken, as are some of the preceding tables, from the celebrated canon of Ptolemy, the Alexandrian astronomer and mathematician, who lived in the time of Marcus Aurelius.

Chaldean Kings.

B.C.	
747	Nabonassar.
733	Nadius.
731	Chinzirus and Porus
726	Jugæus.
721	Mardok Empad, or *Merodach Baladan.*
709	Archian.
704	*Interregnum.*
702	Belibus.
699	Apronadius.
693	Regibelus.
692	Mesessemordak.
688	*Interregnum* 2d.
680	Asaradin, or *Esarhaddon.*
667	Saosduchin.
647	Chyniladon.
625	Nabopolassar, or *Labynitus.*
604	Nabokolassar, or *Nebuchadnezzar.*
561	Ilarodam, or *Evilmerodach.*
558	Nericassolassar, *Neriglissar,* or *Belshazzar.*
553	Nabonadius.

Persian Kings.

536	Cyrus.
529	Cambyses.
521	Darius I. son of *Hystaspes.*
485	Xerxes.
464	Artaxerxas I. *Longimanus.*
423	Darius II. *Nothus.*
404	Artaxerxes II. *Mnemnon.*
358	Ochus.
337	Arogus, or Arses.
335	Darius III. *Codomanus.*

Grecian Kings.

B. C.	
331	Alexander of Macedon.
324	Philip Aridæus.
317	Alexander Ægus.

Egyptian Kings.

305	Ptolemy Lagus.
285	——— Philadelphus.
247	——— Euergetes.
222	——— Philopator.
205	——— Epiphanes.
181	——— Philometor.
146	——— Euergetus II.
117	——— Soter.
81	Dionysius.
52	Cleopatra.

Kings of Syria.

312	Seleucus Nicator.
280	Antiochus Soter.
261	Antiochus II. Theos.
246	Seleucus II. Callinicus.
225	Seleucus III. Keraunus.
223	Antiochus III. Magnus.
187	Seleucus IV. Philopator.
175	Antiochus IV. Epiphane.
164	Antiochus V. Eupator.
162	Demetrius Soter.
151	Alexander Balas.
146	Demetrius II. Nicator.
144	Antiochus VI. Epiphanes.
143	Diodotus, or Tryphon.
B. C.	
138	Antiochus VII. Sidetes.
130	Demetrius II. again.
126	Alexander II. Zebina.
122	Antiochus VIII. Grypus.
97	Seleucus VI. Nicator.
92	Philip.
84	Tigranes, *king of Armenia.*

B. C.

Kings of Damascus.

113	Antiochus IX. Cyzicenus.
95	Antiochus X. Eusebes.
92	Demetrius III. Eukærus.
88	Antiochus XI.
84	Tigranes, *as above.*

This much may suffice as to the most intricate points in chronology; but it may be convenient to have at hand a miscellaneous table of more recent and more easily ascertained events, which therefore we give as follows, reckoning according to the commonly adopted Christian era.

B. C.	
5	JESUS CHRIST born.
4	Death of Herod.
A. D.	
7	The "taxing made by Cyrenius."
8	Christ's first visit to the temple, being in his 12th year.
14	Death of Augustus.
24	Caiaphas made high priest, which office he held 11 years.
26	John Baptist begins his ministry, in the 15th year of Tiberius.
28	Christ begins his public ministry.
30	His transfiguration on mount Tabor.
31	His crucifixion and resurrection.
34	Martyrdom of Stephen.
35	Conversion of Paul.
40	Christians first so called, viz. at Antioch.
50	Paul preaches in the Areopagus at Athens.
64	Persecution of Christians by Nero.
67	Paul and Peter put to death.
70	Jerusalem destroyed by Titus.
80	Successes of Agricola in Britain.
95	Christians dreadfully treated at Rome; and the Apostle John writes his gospel, and the book of the Revelation.
99	Tacitus the historian dies.
108	Ignatius, a Christian bishop, destroyed by wild beasts at Rome.
120	Adrian's wall built.
135	Half a million of Jews destroyed in Judea.
139	Antoninus's wall built.
154	Justin Martyr's apology for the Christians published.
167	Polycarp suffers martyrdom.
177	Christians persecuted at Lyons.
189	Romans defeated by the Saracens, who now appear for the first time in history.
197	Emperor Septimius Severus defeats Albinus.
202	Christians persecuted in Egypt.
209	Caledonians repulsed by Severus.
222	Romans under Alexander Severus pay tribute to the Goths.
236	Another persecution, called the sixth, of the Christians.
250	The seventh persecution.

A. D.

257 The eighth persecution.

269 Emperor Claudius defeats an immense army of the Goths and Heruli.

272 The ninth persecution.

286 Roman empire attacked by the northern nations.

302 The tenth persecution.

313 Christianity tolerated through the empire, under Constantine the Great.

325 The first general council at Nice, where Arianism is condemned.

329 Constantine removes the seat of empire to Byzantium, hence called Constantinople.

361 Emperor Julian abjures the Christian religion.

381 The second general council, held at Constantinople.

400 Alaric the Goth invades Italy.

406 Vandals and other tribes invade France and Spain.

410 Alaric burns Rome, and dies.

426 Romans entirely remove from Britain.

431 Third general council, held at Ephesus.

440 Leo the Great pope.

442 Theodosius II., emperor of the east, makes a shameful peace with Attila the Hun.

448 Romans consent to pay tribute to that chief, who afterwards ravages Germany and France.

451 Saxons under Hengist and Horsa arrive among the Britons, who had vainly sought aid from the Romans against the Picts and Scots.

—— The fourth general council was held at Chalcedon in this year.

455 Rome taken by Genseric the Vandal.

468 Romans expelled Spain by the Visigoths.

476 Rome taken by Odoacer, king of the Heruli, and thus the Western empire was extinguished.

481 Clovis king of the Franks.

488 Theodoric, the Ostrogoth, defeats Odoacer, and is acknowledged king of Italy by Zeno, emperor of the East.

497 The Franks under Clovis converted to Christianity.

507 Clovis defeats Alaric, and is congratulated by Anastasius emperor of the East; but is soon afterwards defeated by Theodoric the Great, who makes peace with him.

510 Clovis makes Paris his capital, and dies next year.

515 Arthur imagined to have begun his reign in Britain.

529 Books of civil law published by the emperor Justinian.

—— Belisarius the Roman defeats the Persians.

534 That general defeats the Vandals in Africa.

543 The Goths recover Italy from the Romans, who, under Belisarius, had re-established their power in it.

549 The same hero retakes Rome, which next year is recovered by Totila the Goth.

558 The Huns defeated in Thrace by Belisarius, who soon afterwards is shamefully treated by Justinian, emperor of the East.

565 The Picts converted by St Columba.

568 Italy subdued by the Lombards.

A. D.

571 Mahomet born.

590 Antioch destroyed a second time by an earthquake, when 30,000 people perished.

596 The monk Augustine converts the Saxons.

602 Emperor of the East acknowledges the supremacy of the Pope.

614 Clotaire II. becomes sole king of France.

622 Mahomet's flight from Mecca to Medina, whence the era of the Hegyra.

625 Persians, Huns, and Slavonians besiege Constantinople.

636 Omar and the Saracens take Jerusalem, which they retained 463 years.

640 Library of Alexandria burnt by the Saracens

648 Cyprus taken by them.

653 Rhodes taken by them.

669 Sicily ravaged by them.

672 Constantinople besieged by them in vain, and their fleet destroyed by the Greek fire.

680 General council of Constantinople.

585 The Britons retire from the Saxons into Wales and Cornwall.

690 Pepin Heristel, mayor of the palace, acquires chief power in France.

700 The Saracens dreadfully defeated by a brother of the emperor Tiberius.

713 Saracens conquer Spain.

720 Constantinople unsuccessfully besieged by Omar II.

726 Emperor Leo forbids image-worship, and quarrels with the Pope on the subject.

735 Bede the historian dies.

749 Race of the Abassidæ become caliphs.

751 Pepin, the founder of the second or Carlovingian race of kings in France.

754 Pepin invades Italy, and grants possessions to the Pope.

756 Dominion of the Moors in Spain established.

762 Bagdat founded as the seat of the caliphate.

772 Charlemagne, formerly joint sovereign, now sole monarch of France.

774 He defeats Desiderius, king of the Lombards, and terminates their dominion, which had lasted above 200 years.

778 Battle of Roncezvalles between the Christians and Moors in Spain.

785 Haroun Alraschid, caliph of Bagdat, invades part of the empire.

787 The Danes land in England for the first time.

794 Charlemagne entirely destroys the Huns.

800 He is crowned emperor at Rome.

814 He dies, and is succeeded by Lewis le Debonnaire.

827 Egbert unites the Saxon heptarchy, and founds the kingdom of England.

838 Kenneth, king of Scotland, subdues the Picts.

848 Saracens destroy the Venetian fleet.

867 England under king Ethelred ravaged by the Danes.

872 Alfred king of England.

880 France, under Charles (the Gross), ravaged by the Normans.

886 Alfred founds the university of Oxford.

890 He divides England into counties, hundreds, and tythings.

Eras and Events.

A. D.

901 Edward (the Elder) succeeds him.
912 The Normans establish themselves in Normandy.
915 King Edward founds the university of Cambridge.
931 Saracens overrun Geneva.
936 Otho, (the Great) emperor of Germany.
954 Lotharius king of France.
959 Edgar king of England.
964 Otho, the emperor, conquers Italy.
987 Hugh Capet founds the third race of kings in France.
1002 Massacre of the Danes in England.
1013 They get possession of the kingdom.
1017 Canute, the Dane, king in it.
1039 Macbeth usurps the throne of Scotland.
1041 Edward (the Confessor) restores the Saxon line of kings in England.
1055 The Turks overturn the caliphate.
1057 Malcolm III. called Canmore, king of Scotland.
1065 The Turks take Jerusalem.
1066 William (the Conqueror) king of England.
1076 Emperor (Henry IV.) excommunicated by the pope.
1095 The first crusade.
1099 Crusaders, under Godfrey of Boulogne, take Jerusalem.
1100 Henry I. (Beauclerc) king of England.
1107 Alexander I. king of Scotland.
1124 David I. king of Scotland.
1135 Stephen king of England.
1139 Portugal rescued from the Saracens.
1147 The second crusade.
1152 Frederick I. (Barbarossa) emperor of Germany.
1158 Henry II. (Plantagenet) of England, and Malcolm IV. of Scotland, have an interview at Carlisle.
1172 The former king conquers Ireland.
1187 Saladin captures Jerusalem.
1189 The third crusade, under Richard I. (Cœur de Lion) king of England.
1192 That prince defeats Saladin at Ascalon.
1202 The fourth crusade.
1204 Pope Innocent III. establishes the Inquisition.
1215 King John of England signs Magna Charta.
1226 Orders of St Dominic and St Francis instituted
1237 The Tartars subdue Russia.
1248 The fifth crusade under St Lewis.
1258 Saracen empire terminated.
1261 Constantinople recovered from the Franks by the Greek emperors.
1263 Alexander III. king of Scotland, defeats the Norwegians.
1264 Deputies of boroughs in England first summoned to Parliament.
1273 Rodolph of Hapsburg, first of Austrian family, emperor of Germany.
1282 The Sicilian Vespers, fatal to 8000 French.
1283 Edward I. conquers Wales.
1290 That king decides competition for the Scottish crown between Bruce and Baliol.
1291 The crusades end.

A. D.

1298 Sir William Wallace, regent of Scotland, defeated by the English at Falkirk.
1299 Ottoman founds the Turkish empire.
1304 Wallace betrayed to Edward I. who puts him to death.
1307 Swiss republics established.
1314 Edward II. defeated by Robert Bruce at Bannockburn.
1327 Edward III. king of England.
1333 He defeats the Scots at Halidoun-hill.
1340 Gun-powder invented.
1346 Victory of the English under Edward III. and Black Prince at Cressy.
1356 Battle of Poictiers, where John II. of France is made prisoner by the English.
1374 Petrarch the poet dies.
1377 Wickliffe, the English reformer, lives, in time of Richard II.
1383 The English first employ cannon in the defence of Calais.
1386 Georgia subdued by Tamerlane.
1392 The Portuguese discover cape of Good Hope.
1398 Tamerlane conquers part of Hindostan.
1400 Chaucer the poet dies.
1406 James I. king of Scotland.
1411 The university of St Andrews in Scotland founded.
1414 Council of Constance, when the popedom became vacant.
1415 Battle of Agincourt, where Henry V. of England defeats the French.
—— John Huss condemned and burnt for heresy; as was Jerome of Prague in the following year—both by the same council.
1420 Madeira discovered by the Portuguese.
1425 Court of Session established in Scotland, by James I.
1431 The Medici family established at Florence.
1436 The French recover Paris from the English.
1440 Art of printing invented.
1447 The Sforza family established at Milan.
1453 The Turks take Constantinople, and thus terminate the Eastern empire.
1459 Copperplate engraving invented.
1461 The Lancastrian party dreadfully defeated at Touton, in Yorkshire.
1464 Cosmo de Medici died.
1472 The Lancastrians again defeated at Barnet, and king-maker Warwick slain,—also at Tewkesbury, after which Edward IV. was restored to the throne.
1474 The Portuguese discover the Cape de Verd isles.
1478 Lorenzo de Medici established at Florence.
1479 The kingdoms of Castile and Arragon in Spain united.
1483 Protectorate and usurpation of the duke of Gloucester, Richard III.
1485 Battle of Bosworth, where he loses his life,—the duke of Richmond, Henry VII. succeeding him, and uniting the rival houses of York and Lancaster.
1491 The dominion of the Moors in Spain termin-

A.D.

ates in the capture of Granada by Ferdinand.

1492 Columbus discovers Hispaniola and Cuba.

1494 In a third voyage he discovers the continent of America, so called by Americus who visited it five years afterwards.

1497 The Cape of Good Hope doubled by the Portuguese, who thence sailed to the East Indies.

1500 The Portuguese discover Brazil.

1508 The league of Cambray against the Venetians.

1513 The battle of Flodden.

1517 Commencement of the Reformation by Luther.

1521 Mexico conquered by Cortez.

1522 Circumnavigation of the globe first accomplished by Magellan.

1524 Sweden and Denmark, which had been united in 1520, embrace the reformed religion.

1526 Charles V. emperor of Germany, and Francis I., king of France, enter into treaty of Madrid.

1527 The former takes Rome.

1528 The revolution of Genoa by Doria.

1529 The Diet of Spires against the Protestants, thence first so called.

1530 The league of Smallcald entered into by them.

1532 The Court of Session in Scotland new-modelled by James V.

1534 The Reformation adopted in England.

1535 The Jesuits founded by Loyola.

1536 Erasmus dies.

1538 Charles V. and Francis I. form the treaty of Nice.

1540 Monasteries dissolved in England.

1543 Copernicus dies.

1544 Charles V. concludes treaty of Cressi with Francis I.

1545 Council of Trent opens.

1546 Martin Luther dies.

1547 Protestants defeated at Mulberg.

—— Scots worsted at Pinkey.

—— Francis I. king of France dies.

1555 Persecution of Protestants by Mary queen of England.

1558 Calais lost by the English, after being possessed by them 200 years.

—— Elizabeth ascends the throne; and Mary marries the Dauphin.

1560 Commencement of civil wars in France.

—— Popery abolished in Scotland.

1561 Queen Mary arrives there.

1564 Calvin dies.

1567 Darnley murdered at Edinburgh.

1568 Mary flies to England.

1569 Regent Murray assassinated.

1570 William, prince of Orange, proclaimed Stadtholder of Holland and Zealand.

1571 The Turks defeated at Lepanto by Don John of Austria.

1572 The massacre of St Bartholomew.

—— John Knox dies.

1574 Africa invaded by Don Sebastian king of Portugal.

1576 The league against the Protestants in France sanctioned by Henry III.

A.D.

1579 Declaration of independence and treaty of union formed at Utrecht by seven of the Dutch provinces.

1580 Sir Francis Drake circumnavigates the world.

1581 The admirable Crichton dies.

1582 The earl of Gowrie seizes James VI.

—— George Buchanan dies.

1584 Sir Walter Raleigh discovers Virginia, so called after queen Elizabeth.

1585 Sixtus V. pope.

1586 Sir Philip Sidney dies.

1587 Queen Mary beheaded.

1588 Spanish armada destroyed.

1589 Henry the Great king of France.

1592 Presbyterianism established in Scotland.

1594 Bank of England incorporated.

1596 English take Cadiz.

1598 French Protestants tolerated by edict of Nantes.

—— Spenser the poet dies.

1600 English East India company established.

1601 Tycho Brache dies.

1603 James I. ascends the throne of England.

1604 Theodore Beza dies.

1605 Gun-powder plot discovered.

1609 Joseph Scaliger dies.

1610 Henry IV. of France assassinated by Ravaillac.

1614 Napier discovers logarithms.

1616 Shakespeare dies.

1618 Sir Walter Raleigh executed.

—— Cervantes dies.

1619 Harvey discovers the circulation of the blood.

1620 English settle at Madras.

1621 Dutch build Batavia.

1623 Camden the historian dies.

1625 Charles I. ascends the throne of England.

—— English first settle in the West Indies.

1626 Protestant princes form a league against the emperor.

1628 Lord Bacon dies.

1630 Kepler the astronomer dies.

1632 Battle of Lutzen, where Gustavus Adolphus, king of Sweden, is killed.

1635 Lopez de Vega, and Tasso, the poets, die.

1638 Solemn League and Covenant established in Scotland.

—— Ben Johnson dies.

1640 John Duke of Braganza recovers Portugal.

1641 Massacre of protestants in Ireland.

—— Vandyke the painter dies.

1642 Civil war in England begins.

—— Galileo dies; also Cardinal Richelieu.

1643 Archbishop Laud executed.

—— Lewis XIV. ascends the throne of France in the 5th year of his age.

1644 Chillingworth the famous polemist dies.

1645 Hugo Grotius dies.

1649 Charles I. beheaded; and the Commonwealth established.

1650 Inigo Jones the architect dies.

1651 Cromwell gains the battle of Worcester.

1654 Cromwell becomes Lord Protector.

—— Jamaica taken possession of by the English.

—— John Selden dies.

1655 Archbishop Usher dies.

Eras and Events.

A. D.	
1657	Admiral Blake dies.
1658	English obtain Dunkirk.
——	Richard Cromwell, protector.
——	Pascal dies.
1660	Monarchy restored in England.
1661	Cardinal Mazarine dies.
1662	The Royal society established.
1663	Province of Carolina planted.
1665	Plague of London.
1666	Fire of London.
1667	Cowley the poet dies.
——	Samuel Bochart, the learned protestant, dies.
1668	The peace of Aix la Chapelle.
1671	Moliere dies.
1672	Great part of Holland conquered by Lewis XIV.
1674	Milton dies.
1675	Marshal Turenne killed.
1676	Sir Mat. Hales dies.
1678	The peace of Nimeguen.
——	Habeas Corpus act passed in England.
1679	Battle of Bothwell-bridge, in which the Scots covenanters were defeated.
——	Thomas Hobbes dies.
1680	Butler and Otway, the poets, die.
1682	Peter the Great, czar of Muscovy.
1683	Lord Russel and Algernon Sydney executed.
1684	Corneille dies.
1685	James II. of England.
——	Edict of Nantes revoked by Lewis XIV.
1688	Revolution in Britain.
——	The learned Cudworth dies.
1689	William and Mary ascend the throne of England.
——	Battle of Gillicrankie.
1690	Battle of the Boyne.
1691	Boyle, the philosopher, dies.
1692	Massacre of Glencoe.
1694	Chr. Huygens, the philosopher, dies.
1695	King William takes Namur.
1696	Racine, the poet, dies.
1697	Peace of Ryswick.
——	The czar Peter defeats the Turks and takes Asoph.
——	Charles XII. ascends the throne of Sweden.
1699	Peace of Carlovitz.
——	Sir William Temple dies.
1700	Charles of Sweden takes Copenhagen.
1701	James II. dies at St Germains.
——	Dryden dies.
——	Society for propagation of the gospel established.
1702	King William dies, and Anne succeeds to the throne of England.
——	War against the French declared.
——	French fleet destroyed at Vigo.
1703	Admiral Rooke takes Gibraltar.
1704	Battle of Blenheim.
——	St Petersburg founded.
——	John Locke dies.
1705	Barcelona taken by the English.
1706	Battle of Ramillies.
1707	Union of England and Scotland.
1708	Battle of Oudenarde.
——	General Stanhope takes Minorca.

Eras and Events.

A. D.	
1709	Charles XII. defeated at Pultowa.
——	Battle of Malplaquet.
1710	South Sea company established.
——	St Paul's cathedral rebuilt.
1711	Charles VI. emperor of Germany.
1712	Earl of Shaftesbury dies.
1713	Peace of Utrecht.
1714	Queen Anne dies, and is succeeded by Geo. I.
——	Lewis XV. ascends the throne of France.
1715	Rebellion in Scotland, and battle of Sheriffmuir.
——	Deaths of Fenelon, Malebranche, and Leibnitz.
——	Total eclipse of the sun.
1716	Turks defeated at Peterwardin by prince Eugene.
——	Aurora-borealis first observed.
——	Septennial parliaments enacted.
1718	Charles XII. killed at Fredrickshall.
1719	Addison dies.
1720	French Mississippi scheme destroyed.
——	English South Sea scheme bursts.
1721	Prior the poet dies.
1723	Sir Christopher Wren dies.
1725	Death of the Czar Peter, who is succeeded by Catharine.
——	Sir Isaac Newton dies.
1727	Death of George I. and ascension of George II.
——	Siege of Gibraltar.
——	Inoculation for small-pox first tried on criminals in England.
1728	Congress of Soissons.
1729	Treaty of Seville between Great Britain, France, and Spain.
——	Dr Samuel Clarke dies, also Sir Richard Steele and Congreve.
1730	Kouli-khan defeats the Turks.
1731	Treaty between the emperor, king of Spain, and Great Britain.
——	Bishop Atterbury and Daniel Defoe die.
1732	Gay the poet dies.
1733	Corelli the musician dies.
1734	Great Britain and Russia enter into a commercial treaty.
——	Dr Arbuthnot dies.
1735	Imperialists defeated by the French in Italy.
1736	Nadir-Schah (Kouli-khan) proclaimed king of Persia.
1737	War between the Turks and emperor of Germany.
1738	The Crimea invaded by the Russians.
——	Westminster bridge begun.
——	Dr Boerhaave dies.
1739	War declared against Spain by the British.
——	Porto-Bello taken by them.
——	Mogul empire overrun by Nadir Schah.
1740	Frederick the Great king of Prussia.
1741	Carthagena taken by admiral Vernon.
——	Prussians take possession of Silesia.
——	Deaths of Montfaucon the antiquary, Rollin the historian, and cardinal Polignac.
1742	Great Britain and Prussia enter into defensive alliance.
——	Halley the astronomer dies,—also Bentley the critic.

Eras and Events.

A. D.	
1743	Great Britain and Russia form defensive alliance.
——	Allies defeat the French at Dettingen.
1744	British declare war against France.
——	Anson's circumnavigation.
——	Pope the poet dies.
1745	Quadruple alliance of Britain, Austria, Holland, and Poland.
——	French defeat the allies at Fontenoy.
——	British take Louisburg and cape Breton.
——	Rebellion in Scotland, and battle of Prestonpans.
——	Dean Swift dies.
1746	Scots rebels defeat the royal troops at Falkirk.
——	Battle of Culloden, and termination of rebellion.
——	Allies defeated by Count Saxe at Raucoux.
——	Earthquake at Lima.
——	Professor Maclaurin of Edinburgh dies; also Southern the poet.
1747	Allies defeated at Lafeldt.
——	French take Bergen-op-zoom.
——	Admiral Hawke defeats their fleet.
——	Revolution in Persia, and murder of Koulikhan.
1748	Peace of Aix-la-Chapelle.
——	Thomson the poet dies; also Dr Watts and Fr. Hutcheson.
1749	Pope and Venetians form a league against the Algerines.
——	Interest of public funds reduced to 3 per cent.
1750	Commercial treaty between Great Britain and Spain.
1751	Peace between Spain and Portugal.
——	Lord Bolingbroke dies.
1752	Introduction of new style into Britain.
——	Whiston dies.
1753	Establishment of British museum.
——	Bishop Berkeley dies.
1754	Great eruption of mount Ætna.
——	Earthquake at Constantinople and Cairo.
——	Fielding the novelist dies.
1755	General Braddock defeated near Fort du Quesne, North America.
——	Dreadful earthquake at Lisbon.
——	President Montesquieu dies.
1756	War declared between France and Great Britain.
1757	Louis XV. attempted to be assassinated.
——	Austrians defeated at Reichenberg and Prague by king of Prussia.
——	Convention of Closterseven.
——	Battle of Rosbach.
1758	The English take Senegal.
——	King of Prussia defeated at Hochkirken.
1759	Battle of Minden.
——	Boscawen defeats the French fleet off Gibraltar, and Hawke another off Belleisle.
——	Capture of Quebec, and death of Wolfe.
——	Handel dies.
1760	Canada taken by the English.
——	George III. ascends the throne.
——	Austrians defeated at Torgau by the king of Prussia.
1761	English take Pondicherry.

A. D.	
1761	Belleisle taken from the French.
——	Bishops Sherlock and Hoadley die, also Dr Leland and Richardson the novelist.
1762	War declared against Spain.
——	The Havannah and Manilla taken.
——	The Jesuits expelled France.
1763	General peace proclaimed; Catherine II. empress of Russia.
——	Shenstone the poet dies.
1764	Sir Hector Munro defeats Suja Dowla at Berar.
——	Various discoveries in South sea by commodore Byron.
——	Churchill the poet dies.
1765	Society of Arts incorporated.
——	Young the poet dies.
——	Blackfriars bridge built.
1766	Stamp act repealed in America.
1767	Wallis and Carteret make discoveries in South sea.
1768	Archbishop Secker dies,—also Laurence Sterne.
1769	First discoveries in South sea by Cook.
——	French take Corsica.
1770	Deaths of Chatterton and Akenside the poets,—also Smollet the novelist.
1771	Gustavus III. king of Sweden.
——	Gray the poet dies.
1772	Revolution in Sweden.
——	Partition of Poland.
1773	Captain Cook's second voyage.
——	Pope suppresses the society of Jesuits.
——	Lord Chesterfield dies.
1774	Lewis XVI. ascends the throne of France.
——	Beginning of American war.
——	Oliver Goldsmith dies.
1775	Battle of Bunker's-hill.
——	Dr Hawkesworth dies.
1776	Americans declare their independence.
——	David Hume dies.
1777	General Burgoyne surrenders to the Americans at Saratoga.
1778	French unite with the Americans against England.
——	Deaths of Voltaire and Rousseau,—also Linnæus.
1779	War between Spain and England.
——	Spaniards besiege Gibraltar.
——	Great eruption of Mount Vesuvius.
——	Captain Cook killed.
——	Lord Chatham dies,—also bishop Warburton, and David Garrick.
1780	Admiral Rodney obtains a great victory over Spanish fleet near Cape Vincent.
——	Riots in London on account of the popish bill.
——	War between Holland and England.
——	Sir William Blackstone dies.
1781	English defeat the Americans at Guilford, and surrender at Yorktown.
——	Georgium Sidus discovered by Herschel.
1782	Admiral Rodney defeats the French fleet off Dominica.
——	Hughes defeats another under Suffrein, in the East Indies.

Eras and Events.

A. D.
1782 Metastasio, the Italian poet, dies.
—— Deaths of bishop Newton, Lord Kames, and Dr William Hunter.
1783 General peace proclaimed, and American independence acknowledged.
—— Deaths of D'Alembert and Euler.
1784 Dr Johnson dies.
1785 Alliance between Austria, France, and Holland.
—— Glover the poet dies.
1786 Death of Frederick the Great.
—— England and France form a commercial treaty.
1787 Notables assembled at Paris.
—— Warren Hastings impeached.
—— Convicts first sent to Botany Bay.
—— Bishops Lowth and Law die.
1788 England and Holland form a defensive alliance.
—— Regency bill proposed in parliament.
1789 States-General assembled at Paris, and form the national assembly—the Bastile demolished—the chief nobility leave the kingdom—the king agrees to the declaration of the rights of man—Marquis Mirabeau dies.
—— Deaths of Mickle and Logan the poets.
1790 Monasteries and titles of nobility abolished in France—general confederation in the Champ de Mars.
—— War in India with Tippoo Saib.
—— Deaths of Dr Cullen, Adam Smith, and Henry the historian, in Scotland; T. Warton the poet in England; and Benjamin Franklin in America.
1791 Lewis XVI. and family intercepted at Varennes, when attempting to escape from France. He accepts the constitution.
—— Riots at Birmingham.
—— John Wesley dies, also Grose the antiquarian.
1792 Gustavus III. assassinated.
—— The king of France insulted at the Thuilleries. The Swiss guards massacred. The royal family imprisoned. France declared a republic. The king tried.
1793 Lewis XVI. executed, as is the queen afterwards. The French convention declare war against England.
—— Toulon surrenders to lord Hood.
—— Reign of Robespierre.
—— Dr Robertson the historian dies; also the earl of Mansfield and Dr John Hunter.
1794 Habeas Corpus act suspended in England.
—— Lord Hood defeats the French fleet off Ushant.
—— Robespierre and party executed.
—— Battle of Warsaw, and Polish liberties destroyed.
—— Deaths of Gibbon the historian and Bruce the traveller.
1795 French fleet defeated by Lord Bridport.
—— French overrun Holland; and Stadtholder takes refuge in England.
—— British take Cape of Good Hope and Ceylon.
—— Sir William Jones dies.
1796 Part of the French royal family retire to Edinburgh.
—— French overrun Italy.

A. D.
1796 Lord Malmesbury unsuccessfully negociates for peace at Paris.
—— Paul emperor of Russia on the death of Catherine.
—— Burns the poet, Dr George Campbell, and Dr Thomas Reid, die.
1797 Earl St Vincent defeats the Spanish fleet.
—— Mutiny of British fleet at the Nore, &c.
—— Lord Duncan defeats the Dutch fleet.
—— Edmund Burke dies.
1798 Rebellion in Ireland.
—— Battle of the Nile.
—— Independence of the Swiss abolished.
1799 British take Seringapatam.
—— Sir Sidney Smith defeats Bonaparte at Acre.
—— British expedition against Holland.
—— Bonaparte made first consul of France.
—— Lord Monboddo and Dr Black die.
1800 Battle of Marengo, in which the French under Bonaparte defeat the Austrians.
—— Armistice between these two powers.
—— British take Malta.
—— Deaths of Cowper and Jos. Warton the poets; also Bryan Edwards, Daines Barrington, and Dr Hugh Blair.
1801 Imperial Parliament of Great Britain and Ireland meet for the first time.
—— Mr Pitt resigns, and is succeeded by Mr Addington.
—— Treaty of peace between Austria and France.
—— Battle of Alexandria, where the victorious Abercrombie is killed.
—— Paul, emperor of Russia, put to death, and is succeeded by Alexander.
—— Battle of Copenhagen, where Nelson takes and destroys the Danish fleet.
—— Convention among the Northern Powers.
—— Cairo taken by the British.
—— Sir J. Saumarez defeats the Spanish fleet.
—— Preliminaries of peace between France and Great Britain signed.
—— Deaths of Lavater, Dr Heberden, Professor Millar of Glasgow, and Gilb. Wakefield.
1802 Definitive Treaty of Peace signed at Amiens.
—— Bonaparte made chief consul, at first for 10 years, and then for life.
—— Prince of Orange resigns stadtholdership.
—— Switzerland entirely subdued by the French.
—— Deaths of Lord Kenyon, Drs Darwin and Moore.
1803 Colonel Despard executed for high treason.
—— Renewal of war with France.
—— Hanover seized by the French.
—— Fresh appearances of rebellion in Ireland.
—— Great Britain and Sweden enter into treaty.
—— General Wellesley defeats Row Scindia.
—— British under General Lake enter capital of the Mogul empire.
—— Deaths of Drs Beattie, John Erskine, and Joseph Priestley.
1804 Duke d'Enghien put to death.
—— Mr Pitt resumes the premiership.
—— Bonaparte appointed emperor.

A. D.

1804 Francis II. relinquishes his title of emperor of Germany.
—— War with Spain commences.
—— The Pope has an interview with Bonaparte at Fontainbleau.
1805 Ligurian republic united with France.
—— Bonaparte takes the title of king of Italy.
—— Lord Melville impeached.
—— Nelson defeats the combined fleet at Trafalgar, and loses his life.
—— Battle of Austerlitz, in which Bonaparte defeats the Austrians and Prussians.
—— Deaths of Prof. John Robison, Arthur Murphy, Drs Paley and Currie.
1806 Death of MrPitt, and, a few months afterwards, that of his great rival Mr Fox.
—— Louis Bonaparte made king of Holland.
—— Battle of Maida, where Sir John Stuart defeats the French.
—— Buenos Ayres surrenders to the British, and is afterwards recaptured.
—— Lord Lauderdale's unsuccessful negociation for peace.
—— Battle of Jena, where the Prussian army is utterly destroyed by Bonaparte.
—— French occupy Hamburgh.
—— British isles declared to be in a state of blockade by Bonaparte.
—— The slave trade abolished by act of parliament.
—— Professor Dalzel, of Edinburgh, dies.
1807 Mr Percival made chancellor of the Exchequer.
—— French take Dantzic.
—— They defeat the Russians at Friedland.
—— Peace of Tilsit, between France, Russia, and Prussia.
—— Attack on Copenhagen, and surrender of Danish fleet.
—— French invade and take possession of Portugal, the royal family of which emigrates to the Brazils.
—— Island of Madeira surrenders to Great Britain, to be kept for the Portuguese.
1808 Bonaparte creates a new nobility in France.
—— French seize the dominions of the pope.
—— Charles IV. abdicates the throne of Spain in favour of his son Ferdinand VII., who is afterwards forced to renounce it by Bonaparte, whose brother Joseph is proclaimed king.
—— Portuguese and Spaniards arm against the French, and the latter solicit aid from Great Britain.
—— Sir Arthur Wellesley's victory at Vimiera, followed by convention of Cintra.
—— Bonaparte and Alexander hold a conference at Erfurt.
—— Dutch ports shut against Great Britain.
—— New war between France and Austria.
—— Battle of Corunna, where the victorious Moore is killed.
—— Duke of York accused by the House of Commons.
—— Gustavus king of Sweden deposed, and succeeded by his uncle.
1809 Lord Cochrane destroys the French fleet in Basque roads.

A. D.

1809 French defeat the Austrians at Eckmuhl.
—— Battle of Talavera.
—— British expedition to Walcheren.
—— Jubilee held in Britain in commemoration of the 50th anniversary of the king's reign.
—— Lord Collingwood defeats the French fleet in the Mediterranean.
1810 Treaty of peace between France and Austria.
—— Bonaparte divorces his wife Josephine, and marries the daughter of the emperor of Austria.
—— Holland annexed to France.
—— Bernadotte nominated crown prince of Sweden.
—— Mr Windham dies. Battle of Busaco.
1811 Bonaparte's infant son created king of Rome.
—— Annexation of the Hanse towns to France.
—— Prince Regent appointed in Great Britain.
1812 Mr Perceval assassinated by Bellingham.
—— Sieges of Ciudad Rodrigo and Badajos—battle of Salamanca.
—— Russia and Sweden unite against France. Bonaparte's calamitous march to Moscow,—and ruin of his army.
—— United States declare war against Britain.
1813 Prussia, Austria, and Bavaria join the allies against France.
—— Battle of Vittoria, and expulsion of the French from Spain.
—— Battles of Lutzen, Dresden, and Leipsic, by the last of which the French were forced to evacuate the whole of Germany.
—— Holland also liberated from French domination recals the stadtholder.
—— Various actions between the Americans and British.
1814 The allies cross the Rhine.
—— Unsuccessful negociation for peace at Chatillon.
—— Wellington advances into France. Part of his army enters Bourdeaux.
—— The allies enter Paris. A provisional government is established there; and Bonaparte being deposed, is sent to Elba.
—— Treaty of peace by the allies at Paris, and the house of Bourbon restored.
—— Visit of emperor of Russia, king of Prussia, and other princes and great men, to London.
—— Ferdinand VII. restored to kingdom of Spain, dissolves the Cortes, and otherwise acts most impolitically.
—— The pope restored to his dominions.
—— British take Washington, the capital of the United States.
—— Norway and Sweden united.
—— Congress of Vienna.
1815 Peace with America ratified at Washington.
—— Nepaulese war in India.
—— Bonaparte, quitting Elba, invades France, and Louis XVIII. leaves Paris.
—— Commissioners of Allied Powers meet at Vienna; declare against the usurper, and arrangements are made to oppose him.
—— Decisive battle of Waterloo.
—— Bonaparte surrenders to an English naval officer; and is afterwards conveyed to St Helena.

A. D.

1815 Louis restored to his throne.

—— General peace.

1816 Jury Court in civil causes established in Scotland.

—— Algiers attacked by Lord Exmouth, and Christian slavery abolished by the dey.

—— Deaths of Mr Sheridan, Dr. Adam Ferguson, and Bishop Watson.

1817 Unsettled state of Britain, and suspension of the Habeas Corpus act.

—— Deaths of Messrs Curran, George Ponsonby, Francis Horner, and Henry Erskine; also Dr. Alexander Munro.

—— Princess Charlotte of Wales dies in child-bed.

1818 Bernadotte ascends the throne of Sweden.

—— The peshwa, or chief of the Mahrattas, surrenders to the British, and so terminates the war in India.

—— Expedition sent to search for a north-west passage; returns unsuccessful.

—— Queen Charlotte dies.

—— Deaths of Sir Samuel Romilly and Lord Ellenborough.

1819 Various disturbances and alarming meetings in Britain.

—— Assemblage of reformers at Manchester dispersed by the military, not without blood.

—— Distresses of the manufacturers.

—— Parliament early called to deliberate on the state of the country.

—— Revolutionary spirit appearing in Germany.

—— Deaths of professor John Playfair and Mr James Watt.

1820 Death of George III. and accession of his son George IV.

—— Conspiracy to assassinate the ministry.

—— Treasonable and rebellious meetings in various parts of the country; and several trials and executions in consequence.

—— Revolution in Naples, and another in Portugal; both without blood.

—— Captain Parry returns from a voyage of discovery in the polar seas.

—— Deaths of Mr Grattan, Sir Joseph Banks, Benjamin West, and Prof. Thomas Brown.

—— Bill of pains and penalties against the queen brought into House of Lords, and abandoned.

SECT. IV. *Order and Connection of Events.*

The epochs and eras now alluded to, as well as the other remarkable periods of time, require to be known, chiefly in relation to what is commonly denominated history, namely, the progress and fortunes of nations and kingdoms. But an acquaintance with them is also of some use in the other subjects to which the term has been applied in this sketch. This will be easily understood, by considering, for example, how greatly the incidents in the life of any important individual, and of course his character, are generally influenced by the public affairs and the predominant features of the time in which he lived. The same thing may be said of a society of individuals, united under one name, and for special purposes, whether of a religious, scientific, or literary nature; nor is it by any means inapplicable to certain subjects of history, which, at first sight, might be thought to have little or no dependence on chronology. It is enough to mention the productions of the fine arts, all of which will instantly be admitted by those who have paid attention to their history, to have a very peculiar relation to different periods, and actually serve with good judges to discriminate and characterize them. This is so peculiarly the case with the productions of the architect, that their style is held to be almost an infallible indication of their age; and though those of the painter and sculptor may occasionally present greater difficulties in the way of an attempt to decide on their age, probably because of their being more subject to the caprice, and taste, and habits, and dishonesty of individuals, they are, notwithstanding, so far amenable to the same generic influence, as to be frequently appreciated by their relation to time, as well as to the country or school in which they appeared. Music affords evidence of equal force in support of this principle; for it is perfectly impossible that any one, who is qualified to form an opinion on the subject, should confound a composition of Haydn or Beethoven with the state of the art among the ancients, or even that in the age of Corelli. The history of the purer sciences, and of the merely useful arts, will be allowed, without a moment's hesitation, to be appealed to in confirmation of the same fact.

Chronology, therefore, is common to all the subjects of history. But, in order to render it subservient to the development of the progress of any of them, it would require to be graduated and portioned out, in a manner suitable to the specific nature of the particular topic. A list of emperors and kings, with the corresponding dates of their reigns, may be, nay, certainly is, highly useful in treating of the origin, advancement, and destinies of nations, because these personages are commonly, from their office and influence, of most note in the public or political affairs of mankind. But what has such a list to do, it may be asked, with the progress of the arts or sciences, or what, save an occasional, and, generally speaking, a very inconsiderable patronage, have such personages done in furtherance of these concerns, that their names should appear as land-marks in this kind of history? This is a species of courtesy which the dignity of philosophy ought to disclaim, were it not, to a certain degree, enforced, by a consideration of the convenience arising from the greater regularity in the periods of these nominal chiefs, than can be looked for or found in those of the individuals to whom, from their actual services in the cause, the post of excellence is justly due. Kings succeed one another in a tolerably regular order, so as to admit, as we have seen, a certain arithmetical amount of their reigns to be determined on; but the real masters in the fine arts appear at such extremely different intervals, that it would be useless to attempt reducing their occurrence to any precise average; and certainly, the appearances of remarkable characters, and the rise of institutions and associated bodies, are not less anomalous phenomena. Perhaps, then, a chronology, in order to be appropriate, would require to have its dates pointed out, not by the

Order, &c. of Events.

names of persons, however eminent or beneficial they may have been, but by epithets and definitions which singled out the most striking features and the leading events of the respective times. In reality, a new nomenclature is as much a desideratum in this department of literature as ever it was in any of the natural sciences. This leads us briefly to notice the importance of the order and connexion of events in every species of history.

These pertain in so great a degree, and so very obviously, to the times in which they occurred, that it may said, to specify one of them is to determine the other. But though this be the case, yet, as time is not the only element to be taken into an account in an inquiry into events, a narrative of them cannot be reckoned complete, or prove satisfactory to an inquisitive mind, unless, in addition to a correct chronology of their occurrence, it point out another relation existing among them.

We allude to the connexion of cause and effect, or motive and action; but, in doing so, have no mind to discuss the metaphysical question to which these terms serve as a title. Whatever may be suggested, on a strictly logical ground, against the idea of any necessary relation between one event and another, the common sense of mankind sanctions what has universally been held as a duty of the historian, namely, the investigation of those elementary principles of action, be they essentially operative or not, to which the events and phenomena that come under his notice may be traced; and it is well known to be in this part of his office that the greatest difficulties are to be encountered, and some of the highest excellencies to be displayed. Here it is that the philosophical spirit must come in to the aid of the mere chronicler, whose labours have never been imagined either to require much genius or to confer much honour.

The causes, to use the current phrase, the causes which the historian has to explore, are necessarily as various as the subjects of which he has to treat; and many of them may combine in the production of the same event. But they are probably susceptible of classification, though not easily of enumeration. Among the heads to which they are referable may be mentioned, in the first place, the wants, the passions, the interests, and the habits of mankind; the peculiarities of their condition as natural and political beings; their relation to the region and age in which they live; the revolutions and changes to which they have been exposed; and many circumstances which are commonly called accidental, but which, by every one who believes in the existence and constant superintendence of a wise, powerful, and benevolent Deity, must be thought worthy of a very different epithet. These are all causes which specially pertain to the task of him who narrates the progress of nations, or the lives of individuals; and it is in the success with which he discovers them, and shows their operation, that the superior sagacity and acquaintance with human nature, possessed by one writer above another, are frequently manifested, though in other qualities he may be greatly defective. To another head belong the whole train and variety of what are called physical causes, those principles to which are legitimately traced and referred the phenomena that occur in the material world, as partitioned among the sciences. A third class is made up of causes of a mixed nature, being partly of the first and partly of the second kind; and these are of very general occurrence in the topics of history. Each of these classes may be subdivided; but as this is rather the province of philosophy in the abstract, or what may be called the logic of philosophy, we shall not now enter upon it.

Examples of the happy investigation of these causes might be easily adduced from well known writers. Thus Dr Ferguson's Essay on the History of Civil Society furnishes one under the first head; as does Campbell's Essay on British Poetry, prefixed to his Selections. Gibbon's celebrated chapter on the Progress of Christianity, may be given as another good example; only of this it is requisite to add, that, in his scepticism or malignity towards revelation, this ingenious man has sophistically confounded together two things that are widely different, though nominally the same,--namely, the pure religion founded by Christ, and that which, under the same title, is essentially and radically a corruption of it. This distinction, which the plainest man who reads his bible may be at no loss to understand, being attended to, will render an essay which has given great offence, not only inert as a covert attack on Christianity, properly so called, but actually an illustration of its divine origin and authority. The introduction to Maclaurin's Account of Newton's Discoveries; some of the historical sketches of Dr John Robison, to be found in his scientific contributions to the Encyclopædia Britannica; and the late Mr Playfair's Preliminary Dissertation on the Progress of Physical Science, in the last Supplement to that work, are among the finest specimens we can mention under the second head. Those under the third are vastly more numerous, plainly because the topics which require an investigation into mixed causes are more abundant than those which are confined to the two simpler classes. Most of the commonly known histories are of this kind, and need not be particularized; but we cannot help alluding with special commendation to part of an excellent work, the general merits of which might entitle it to notice, we mean the Philosophy of Modern History by Dr Millar of Dublin; and the portion of it to which we now refer is that chapter of the first volume which treats of the relation between natural geography, that is, the form and position of certain portions of the earth, and the progress of mankind in peopling different countries.

Qualities of an historian.

SECT. V.—*Qualities of an Historian.*

It will not be difficult, after what has been said on the nature of this science, to point out the chief requisites in one who ventures professedly to engage in it with a view to publication; but the examples of excellence in this department have been so rare, that, in delineating the character, one is influenced rather by the consideration of what is desirable, than either by the observation of what has existed or the hope of what may yet be produced. If, in ennobling that character, or raising highly the standard by which it

Qualities of an historian.

is to be estimated, we should be found to disparage many who have aspired to its name and its honours, we shall stimulate a generous ambition, and can repel those only who feel themselves more tempted by the supposed facility of success than urged by the qualities which can ensure it. Here, as on the subject of poetry, some gross errors have been committed; and they are, perhaps, the more to be reprehended, because an unfortunate attempt to instruct must be held a greater presumption than a feeble effort to please. But there can be no serious harm done to any one, it is imagined, by suggesting what is calculated to repress an ill-founded or an excessive desire to hazard either.

The qualities of an historian, then, be it remarked, in the first place, are those of the philosopher; a talent for observation; the power of discriminating between things apparently the same but virtually different, and detecting identity or real correspondence amid seeming contrarieties; a familiar acquaintance with the laws of inductive logic, and an aptitude to employ them; activity of spirit to generalize, when necessary; and a judgment so fully matured, as to be competent to ascertain the value of evidence, whilst it is sufficiently established above the imaginative faculties to economize deductions from those premises with which it is satisfied. These may be called intellectual qualities, and would, alone, generally prove sufficient for the common purposes of history, where there existed no temptation to falsify a narrative, to conceal or misrepresent facts,—as in treating merely of the arts and sciences. But as prejudices may disturb the mind, and the notion of real or imaginary interest vitiate it, there requires another description of qualities where the historian is occupied with public concerns, or the lives and characters of individuals,—and these may be styled moral. The chief of them, and that to which the rest may be reduced, is the supreme love of truth; and this, indeed, is so essential, that without it no other excellence ought to be allowed to redeem the historian from reproach. To a man thoroughly influenced by this principle, the claims of justice will seem so paramount to every other consideration, as frequently to prompt him to make inquiries from which no pleasure can be anticipated, and occasionally to form conclusions, at variance alike with his own predilections and his wishes, and the sentiments of his time. Under this head, therefore, may be comprehended what is usually known by the name of impartiality—certainly a faulty term for the virtue designated by it, inasmuch as partiality, of which it is the negation, so far from being essentially a vice, is both allowable and desirable, provided it be in subordination to the principle now commended. Another quality, referrible to the same head, because the result of its operation, and already alluded to as such, is a conscientious and persevering industry, which rests not till it has exhausted every accessible source of information, and even then admits, while it regrets, the possibility of other materials existing, which, could they be obtained, would claim farther labour, and might warrant some modification of opinion. Lastly, is to be mentioned here, a heroism of spirit, which, in quelling the suggestions of selfishness, and contravening the prevalent or the fashionable opinions of time and place, looks forward, with tranquil and dignified confidence, to the ultimate triumph of that cause in which it may be its destiny to suffer.

Qualities of an historian.

A regard to truth, it is almost unnecessary to observe, will prevent the introduction, into historical works, of every thing, however ingenious, or of the nature of embellishment, which cannot be proved to have existed at the time to which it is ascribed, and in the manner in which it is reported, or which at least is not fairly and obviously deducible from the circumstances of the case. Of this sort are many of those discussions and speeches in which historians of note have conceived themselves at liberty to indulge, when by so doing they could calculate on the sympathy of their readers.

To another class of qualities, those which relate to the literary talents and attainments of the historian, his style of composition, the correctness, elegance, and force of his diction, the distribution and arrangement of his subject, it is enough barely to advert as incidental, for we know of no rules touching these particulars, which are not common to him with other descriptions of authors.

HITCHIN or Hitching, a town of Hertfordshire in England; contains more than 3000 inhabitants, and has been long famous for its corn market.

HITHE or Hythe, a town of Kent in England, and one of the Cinque Ports. See Kent.

HIVE, an artificial structure, in which domestic bees prepare their wax and deposit their honey. See Bee.

HOADLY, Benjamin, a learned English prelate, was a native of Kent, and was born in 1676; received the early part of his education from his father, who was a clergyman and master of a private school, and completed his academical studies at Cambridge, where he was elected a fellow of his college. Having entered into holy orders, he was first appointed to a lectureship in London, which he resigned, and was presented to a rectory also in the metropolis. About this time Mr Hoadly commenced author, and was immediately involved in those controversial discussions which continued through the greater part of his life. He was next engaged in a literary warfare with the celebrated bishop Atterbury, and with Dr Blackall, bishop of Exeter. These controversies, which called forth numerous letters, answers, and replies, relate either to various points of Christian doctrine or political institutions.

On the accession of George I. Dr Hoadly was appointed one of his chaplains, and soon after was promoted to the see of Bangor. A sermon which he preached in 1717 before the king, on "The Nature of the Kingdom or Church of Christ," excited great clamour among the clergy of the high church party, and gave rise to the famous *Bangorian controversy.* The object of bishop Hoadly, in this controversy, was to shew that all restraints with regard to religious opinions have no foundation in the gospel; that it is a prostitution of the holy sacrament to apply it to a purpose of a different nature from what its great author intended; and that the test and corporation acts are repugnant to reason and to justice. Dr Hoadly was successively advanced to the sees of Hereford and Salisbury, and finally translated to the rich see of Winchester, in the possession of which he died in 1761, when he had reached the 85th year of his age. He was, besides, the author of "A Plain Account of the Nature and End of the Sacrament of the Lord's Supper," which also met with keen opposition, and of "Sermons chiefly Preached on Public Occasions." An edition of his works in three volumes folio, with an account of the author, was published in 1773, by his son Dr John Hoadly.

HOADLY, Benjamin, eldest son of the bishop of Bangor, was born in 1706, was educated at Cambridge, and having settled in London as a medical practitioner, he was appointed physician to the king's household, and afterwards to that of the prince of Wales. He was the author of a treatise "On Respiration," of "Observations on a Series of Electrical Experiments," and he assisted Hogarth in the composition of his "Analysis of Beauty." But his name will be best remembered as the author of the well known comedy of the "Suspicious Husband," which first appeared in 1747, and still retains its place on the stage. He died in 1757.

HOBBES, Thomas, a political writer, was born at Malmesbury in Wiltshire, in the memorable year 1588, when England was threatened and visited by the Spanish armada; was early distinguished for his classical learning; and having finished his studies at Oxford, was admitted into the family of the earl of Devonshire, as the tutor and companion of his eldest son, with whom he visited France and Italy, which afforded him an opportunity of enjoying the friendship and society of Galileo and other celebrated philosophers of the time. With lord Bacon he lived on terms of familiarity, and was employed by the great reformer of philosophy to translate some of his treatises into the Latin language.

The first literary production of Hobbes, which was a translation of Thucydides, appeared in 1628. On the death of his noble pupil he was again engaged in the same capacity, and again resided for some time in France; and soon afterwards he resumed his situation in the Devonshire family, in which he may be considered as an inmate during his future life. Superintending the studies of the young earl in Paris, and associating with Gassendi, father Mersenne, and other learned men of that metropolis, Hobbes was led to the study of those subjects which most frequently formed the topic of conversation; and accordingly, with his usual ardour, he commenced a course of mathematics when he was in the 40th year of his age. His attention was strongly attracted to this branch of knowledge by considering the 47th proposition of the first book of Euclid, and the elegant and striking demonstration with which it is accompanied.

The prevailing controversial discussions of politics and religion naturally induced a person of profound thinking to investigate the principles on which these discussions rested. With this view, Hobbes wrote his treatise *De Cive*, which being circulated in England, appeared so obnoxious as to expose the author to prosecution; to avoid which he withdrew to Paris, where it was printed in 1642.

In 1647, Hobbes was recommended, on account of his mathematical learning, to instruct the prince of Wales, afterwards Charles II. in that branch of knowledge; and whatever progress his royal pupil may have made in the science, Hobbes had the good fortune to secure the favour and esteem of the prince through life. In 1650, the treatise *De Homine* appeared; and in the succeeding year his *Leviathan*, which contains a farther view of his opinions on moral and political subjects, was published. In 1654 appeared a letter on Liberty and Necessity, which drew him into a keen controversy; and about the same time he commenced another controversy, with a very able opponent, Dr Wallis of Oxford, in which the dogmatism and obstinacy of Hobbes were more conspicuous than his knowledge of the subject in dispute.

Having passed the period of the protectorate unmolested, Hobbes repaired to London on the restoration in 1660; renewed his acquaintance with the king; obtained a pension, and received other marks of royal favour, although the obnoxious tenets of the author, which became the subject of parliamentary censure, precluded the king from shewing him that favour which his predilection for his old tutor disposed him to cherish. In 1675, he published his English translation of the Iliad and Odyssey. In 1678 appeared *Decameron Physiologicum*, or ten dialogues on natural philosophy; and about the same time *Behemoth*, or the history of the civil wars from 1640 to 1660.

For some years previously to his death, Hobbes had retired to the residence of the earl of Devonshire in Derbyshire, where he continued his studies with great vigour and perseverance; and in his 85th year he composed a biographical sketch of himself, in Latin verse. He died in 1679, when he had reached the 95th year of his age.

The writings of Hobbes, which bear obvious marks of a powerful genius, excited no small degree of interest when they first appeared. Many of the principles which he has espoused and attempted to maintain, both with regard to politics and religion, are undoubtedly erroneous. Now, they are to be regarded as little else than objects of curiosity, and perhaps, at the time they were first promulgated, scarcely merited the attention and consideration which they obtained.

HOFFMAN, Frederic, an eminent German physician, and voluminous medical writer, was a native of Halle in Saxony, and was born in 1660; received the early part of his education at the public school of his native city, and pursued the study of medicine at the university of Jena, where he read lectures on chemistry. Having practised physic for some time at Minden, he visited Holland and England, and associated with the learned men of those countries, among whom is mentioned Mr Boyle, whose reputation as a natural philosopher then stood high. In 1688 he settled as a medical practitioner at Halberstadt; and in 1693, when the university of Halle was established by the first king of Prussia, Hoffman was appointed to the chair of medicine and natural philosophy; and, at his recommendation, Stahl, the celebrated founder of chemistry as a science, was nominated as his colleague, and proved in the sequel a great rival to his fame as a teacher. While Hoffmann continued to discharge his academical duties, he published many learned treatises, which gave celebrity to his name in every country of Europe.

Accompanying some patients of rank to the warm baths in Bohemia, he had an opportunity of examining the nature and properties of these springs, concerning which he published a dissertation. The waters of Seidlitz and other mineral waters of Germany successively engaged his attention, and some of them were first brought into notice in consequence of his inquiries. In 1708 he was appointed physician to the king of Prussia, with a liberal salary; and in that capacity resided three years at court. In 1712 he resumed his academical functions at Halle, and some years afterwards commenced the publication of his "System of Rational Medicine," which attracted much notice; and, excepting a short attendance on the Prussian monarch, during his illness in his camp on the Rhine, he continued his lectures in the university till his death in 1742, when he had reached the 82d year of his age.

The collected works of Hoffmann have been published in six volumes folio; and, although they are mixed up with much theory, they contain a great deal of useful practical matter. In his views of the doctrine of *spasm* and *atony*, a doctrine which, as the medical reader is aware, was revived and expanded by Dr Cullen, he is opposed to the humoral pathology, which ascribes the deranged state of the animal frame to the viscidity or acrid nature of the fluids, rather than to a change in the action of the solids, or some preternatural affections of the nervous system.

HOGARTH, William, an English painter, of truly original genius, and peculiarly distinguished for his talents in the comic representation of men and manners, was born in London in 1698, and, with a very limited education, was apprenticed to a silversmith; and being chiefly confined to that branch of the business which consists in engraving cyphers and coats of arms on plate, he acquired some practice in drawing, and, before the period of his apprenticeship had expired, gave some proofs of his powers for ludicrous caricature. Guided by the impulse of genius, he looked far beyond the humble sphere in which he seemed at first destined to move; and for the purpose of qualifying himself to rise to higher eminence, he studied drawing from the life, at the academy for design in St Martin's lane.

The first production of his pencil that attracted notice, is a representation of Wanstead assembly, in which are introduced lord Tylney, lady Tylney, their children and tenants; the finishing and colouring of which are preferred by some to his later pieces. About the year 1720 Hogarth commenced engraver in the humble department of arms and shop-bills, from which he advanced to furnish designs and engravings for books; among which was a set for Butler's Hudibras, of which it has been remarked, that the expression of humour indicates little of that talent which is so conspicuous in his future works. A clandestine marriage, in 1730, with the daughter of Sir James Thornhill, history painter to the king, gave offence to the father-in-law. To effect a reconciliation, some scenes of the Harlot's Progress were purposely thrown in the knight's way; the scheme was at first unsuccessful, and extorted only the cold remark, that the artist who could produce such works was capable of maintaining a wife without a dowry; but in the end Sir James relented, and admitted his daughter and son-in-law as inmates to his house. The work now alluded to not only established the reputation of Hogarth as an artist, but added greatly to his emolument, while it proved that as a painter of the manners of the age, with the singular felicity of mixing the serious with the comic, he had no competitor. The Rake's Progress, which appeared in 1735, was less successful; and he was not more fortunate in his attempts at painting sacred and profane history; but for these failures, Marriage a-la-mode, Industry and Idleness, the Stages of Cruelty, and the Election prints, which appeared in different series, made ample amends. In the representation of these scenes, Hogarth has successfully taught striking lessons of morality; all his pieces are satires of particular vices and follies, expressed with great strength of character, and elucidated by the minutest and most appropriate circumstances. Every thing has a meaning, and contributes to form a lively picture of human manners. The numerous comic pieces which proceeded from the pencil of Hogarth, such as the March to Finchley, Modern Midnight Conversation, The Sleeping Congregation, Strollers in a Barn, and others, are not less conspicuous for the wit and fancy which they display, than for the copious source of entertainment which they afford to those who study them with attention.

Hogarth appeared in 1753 as an author, by the publication of "The Analysis of Beauty, written with a view of fixing the fluctuating ideas of Taste." The object of this work is to shew that beauty fundamentally consists in the union of uniformity and variety, which is found in the waving or curved line; but the principle assumed by Hogarth was not generally adopted, any more than the theories proposed by succeeding authors have been admitted as the foundation of the principles of taste.

In 1757, Hogarth succeeded to the place of serjeant painter to the king, on the resignation of his brother-in-law Mr Thornhill. His official situation, it is supposed, led him to employ his talents in party politics. With this view, the print entitled the Times, was published in 1763, as a satire against Wilkes and his friends; the strictures on Hogarth, which appeared in the North Briton were answered by a caricature of Wilkes, and an angry epistle addressed by

Churchill to the painter was retaliated by a caricature of the poet. None of the parties engaged in this warfare, it would appear, gained any credit to himself.

From this time the health of Hogarth began to decline, and he died suddenly in 1764; he was interred at Chiswick, under an elegant mausoleum erected to his memory.

The death of Hogarth spread a general gloom; it was a subject of lamentation in every tavern; the festivities of the social clubs suffered a solemn pause while they offered a libation to the memory of the admired artist; and the tender muse of Garrick soothed his affection in the following appropriate epitaph for his departed friend:

> Farewell, great painter of mankind,
> Who reached the noblest point of art;
> Whose pictured morals charm the mind,
> And through the eye correct the heart.
> If *genius* fire thee, reader, stay,
> If *nature* touch thee, drop a tear;
> If neither move thee, turn away,
> For *Hogarth's* honoured dust lies here.

The reader who wishes to study and understand the works of Hogarth, may consult, with peculiar advantage, *Hogarth Illustrated* by Mr Ireland; Nichol's *Life of Hogarth*; and Walpole's *Anecdotes of Painting*, Vol. IV., in which a catalogue of all his prints is given.

HOLBEIN, Hans, or John, a painter of great celebrity, was born at Basle in 1498, and was at first instructed by his father in the art in which he afterwards acquired so high a reputation. He was also a proficient in the kindred arts of engraving, casting, modelling, and architecture. He painted equally well in oil, water-colours, and distemper; and, with great powers of invention, he possessed sufficient patience and perseverance to give his works the most exquisite finish.

Some excellent portraits of his cotemporaries, among which was that of the illustrious classical scholar Erasmus, and some works which he executed in the town-house of Basle, raised his reputation in his native city; but his dissipated habits reduced him to indigence. At this time he accepted of an invitation from the Earl of Arundel to visit England; and in 1526, being recommended to Sir Thomas More, he was received into the family of that statesman, whose house at Chelsea was his residence for three years, while he was occupied in painting portraits of Sir Thomas and his friends. Having attracted the notice of Henry VIII., he was engaged in that monarch's service, had apartments provided for him in the palace, with a regular salary, and was chiefly employed in painting portraits of some of Henry's queens. Holbein resided in England till his death in 1554.

The fullest catalogue of the numerous works of Holbein is given by Mr Walpole.

The eight pieces of Christ's passion, in the town-house of Basle, which were painted by him, have been always held in great estimation; but the Dance of Death, on the walls of a cemetery at Basle, and commonly ascribed to him, was painted before his time. These walls were destroyed by the French in 1805. It seems not unlikely that Holbein took the hint from these paintings of executing a set of drawings, which he completed with great improvements, and which were engraved by Hollar. The picture in Surgeon's hall, London, of Henry VIII. granting the charter to the company, another in the hall of Bridewell, in which Edward VI. presents to the lord mayor of London his charter of donation of Bridewell for an hospital, and two large pieces in distemper for the Easterling merchants in London, representing the triumphs of riches and poverty, were painted by Holbein. The latter two pictures have perished, but the drawings of them yet preserved shew great powers of fancy and expression.

HOLBERG, Louis Baron Von, an eminent writer and professor at Copenhagen, was a native of Bergen in Norway, was born about the year 1685, and, before he had completed his first year, had the misfortune to lose his father, who had risen from the station of a common soldier to the rank of lieutenant-colonel in the army; and soon after his father's death, the property bequeathed to the family was destroyed by fire. In his tenth year he was deprived of the care and protection of his mother; some time after he was appointed a corporal in a Norwegian regiment; but having discovered a strong predilection for learning, he resigned the humble military office, and was admitted by a relation to the care of the tutor of his children. Patronized by an uncle, he made still farther improvement in letters, first at the public school of Bergen, and afterwards for a short time at Copenhagen; but the want of funds for his support abridged his stay in that capital, and compelled him to return to Norway, where he was engaged as tutor in the family of a clergyman, whom he occasionally assisted in preaching. In consequence of some disagreement he was soon dismissed from this situation, to the great regret of the peasants, who were delighted with his eloquent harangues. Returning once more to Copenhagen to complete his theological studies, he acquired a knowledge of French and Italian; and after a short stay in his own country, where he was again employed as a tutor, he was seized with a strong desire of travelling.

Having raised about sixty dollars by the sale of what property he could command, he sailed to Holland; having made some stay at Amsterdam, his funds were exhausted, and while he resided at Aix-la-Chapelle he supported himself by his skill in music. With no small difficulty he obtained a passage to Norway, and having reached Christiansand he commenced teacher of languages, passed the winter with a clergyman, and in company with a friend visited England in the spring. Remaining some time in London, he proceeded to Oxford, and from the exhausted state of his funds was in great embarrassment, from which his skill in music, and his knowledge of the learned languages, again relieved him. Having revisited Copenhagen, he resumed his travels through various parts of Germany, and about this time commenced his career of authorship, in his Introduction to the Modern History of Denmark, which was dedicated to the king, and procured for him the appointment of an extraordinary professor at Copenhagen. To this appointment a salary being afterwards attached, encouraged his propensity to travelling; he visited Paris, and continued in that metropolis for a year and a half; proceeded to Rome, performing the greater part of the journey on foot; spent the winter in that capital; and after journeying in different parts of Italy, found himself on his return to Copenhagen still doomed to struggle with difficulties. On the publication of "An Introduction to the Law of Nature and Nations," the dawn of better fortune appeared, and the appointment of professor of metaphysics soon followed.

Jurisprudence, history, and languages were hitherto the subjects of Holberg's studies and speculations; he now began to cultivate poetry; and his first attempt, which was a heroi-comic piece, is still popular in Sweden and Denmark. His reputation as a writer was now established, and most of his productions were well received, and translated into different foreign languages. In 1735 he was appointed rector of the university of Copenhagen, and in his official situation greatly promoted literary composition among the students by proposing subjects for prize poems. His income was now considerable, and as he lived economically, and acquired some property by his literary labours, he amassed a handsome fortune, part of which was laid out in the purchase of an estate in Iceland, and part was bequeathed to the academy of Soroe for the education of young noblemen. This liberality acquired for him the rank of baron, and his memory was celebrated by an annual oration before the academy. The generosity of Holberg had not yet reached its limits, for he left 16,000 dollars, the interest of which was to be laid out in providing establishments for young women of Copenhagen. Holberg died in 1754.

This extraordinary man possessed a strong turn for satire and ridicule, of which he has given a notable specimen in "Klimm's Subterranean Travels, containing a new Theory of the Earth, with a Description of the Fifth Monarchy, which hitherto has been totally unknown." This work, originally written in Latin, is a romance or allegory on the plan of Gulliver's Travels, and became so popular as to be published in seven different languages. The establishment of a theatre at Copenhagen, in 1722, called forth the talents of Holberg as a dramatic writer. His comic productions were very successful, although he has been charged with exhibiting vulgar manners and coarse humour, as if refined manners and delicate wit could have been at all pleasing to the semi-barbarous audience for whom he wrote. Holberg was the author of numerous other works, in almost every department of literature, a list of which will be found in the "*General Biography*."

HOLCUS, Indian Millet, a genus of plants belonging to the Polygamia class.

HOLINGSHED, Ralph, an early English historian or chronicler, was a native of Cheshire, was born about the year 1520, and it is supposed was educated at Cambridge; but little is known with certainty of his education or profession. It is said he was steward to a gentleman in Warwickshire, in which capacity he died about the year 1580. Holingshed's Chronicles were first published in 1577, in two volumes *folio*. Part was compiled by himself, but he received considerable assistance from others; and the second edition, published in 1587, in three volumes, was brought down to the preceding year by John Stowe. Parts of the first edition, which gave offence to queen Elizabeth, were left out in those that followed.

HOLLAND, the largest of the seven United Provinces while they existed in the form of a republic, has for its boundaries on the south and west Dutch Brabant and Zealand, and the German ocean or North sea, and on the north and east the Zuyder sea and the province of Utrecht and part of Guelderland, and was divided into South and North Holland. But the whole is now included in the kingdom of the Netherlands. See Netherlands.

HOLLAND, NEW.

Holland, New, Notasia, or Australia, is generally described as the largest island in the known world; but it ought rather to be regarded as a fifth continent, as, though insulated, it is of vast extent. It is situated between the Indian and Pacific oceans, between 10° and 39° of south latitude, and between 113° and 158° of east longitude. Its greatest length is from W. to E. about 2100, and its greatest breadth from N. to S. about 1200 geographical miles, and its superficial extent is computed to be equal to three-fourths of the continent of Europe. This large tract of country forms the greatest portion of Australasia, and is bounded on the north by Torres' and Endeavour straits, which separate it from New Guinea, and on the south by Bass's strait, lying between this continent and Van Diemen's land, while on the east and west it is washed by the waters of the ocean.

Outline and aspect.—Little more than the coasts of New Holland have been examined with sufficient accuracy to describe its general appearance. The outline is very irregular,—rounded but much indented on the east and west, and hollowed out into capacious bays on the north and south-west. The coasts are in general low, rocky, and sandy, and exhibit only dwarf shrubs or low flowering plants. A few miles within this barren belt, on the eastern coast, which is best known, are ranges of lofty mountains, interspersed with forest trees of a majestic size, with little or no underwood; and still nearer the interior are flat plains of a vast extent, watered by numerous streams, partly teeming with fertility and partly forming unproductive fens.

Bays.—Of the numerous indentations which mark the coast, and form bays and harbours, the most important are the gulf of Carpentaria on the north;

New Holland.

New Holland.

Repulse bay, Port Macquarie, Port Stephens, Broken bay, Port Jackson, Botany bay, and Jervis bay, on the east; Port Phillip, the gulf of St Vincent, and Port Lincoln, on the south and south-west; and Shark's bay on the west. Of these inlets, the most commodious, and one of the most extensive as a harbour for shipping, is Port Jackson, as it is completely land-locked, and has sufficient depth of water for ships of any burden, with excellent anchorage, and numerous coves and head-lands.

Mountains.—Although much of the country near the coast be high and rocky, little is known respecting the mountainous districts. The principal ranges hitherto discovered are the Blue mountains, to the west of the settlement at Port Jackson, where one point, called Mount York, is 3292 feet above the level of the sea, though much higher land has been seen near Port Macquarie, and Arbuthnot's range, between 32° and 33° of north latitude, and in about 149° east longitude; but a hill of considerable elevation, mount Dromedary, forms a conspicuous promontory to the south of Jervis bay.

Rivers and lakes.—Except in the vicinity of the British settlements in New South Wales, no rivers of any consideration have yet been discovered; but the Blue mountains give origin to several streams, and appear to be the source of two large rivers, the Hawkesbury and Macquarie. The former rises on the eastern side of the chain by several branches, the principal of which is called the Nepean, and, winding to the northward, takes at length an easterly direction, and falls into the Pacific through the medium of Broken bay. This river is navigable for vessels of considerable burden for above 100 miles above its mouth; but it is subject to occasional inundations, which are productive of much loss to the settlers. The Macquarie appears to originate on the western side of the Blue mountains, and flows towards the west and north-west, through a flat country, at first woody and extremely fertile, and forming excellent pasturage, but gradually becoming rocky, swampy, and marshy, till it terminates in an extensive morass covered with water. The middle part of the river is 200 or 300 feet broad, and often more than 20 deep, so as to bear vessels of almost any burden, were not navigation obstructed by occasional rapids and cataracts. It has been lately traced by Mr Oxley, the surveyor-general of New South Wales, for several hundred miles, and great hopes were entertained that it would be found to terminate somewhere on the western coast of New Holland, so as to secure an inland navigation, by which the valuable productions of the colony might be conveyed to India and Europe by a safer and less circuitous route than that which is now employed. But these sanguine expectations have been for the present disappointed; and Mr Oxley's last expedition has rendered it more probable that the waters of this majestic river are lost in an inland sea. Besides these two rivers of primary importance, the colonists enjoy the advantages of several smaller, as the Hastings, which flows in an easterly direction into Port Macquarie, Hunter's or the Coal river, which empties itself into Port Hunter, and is navigable to boats for about 200 miles from its mouth, but is subject to similar inundations with the Hawkesbury; George's river, which falls into Botany bay; and the Lauchlan, which rises on the west of the Blue mountains, and after pursuing a westerly course for some hundred miles is dissipated in a morass.

Numerous *lakes*, or rather lagoons, are formed in the course of the large rivers by their overflowing waters, but are not of sufficient size or permanence to merit particular notice.

Soil and climate.—It is only in the British colony of New South Wales that the soil of New Holland has been accurately examined; and there, it is stated by a late writer, to be of every description, from the sandy heath and cold hungry clay to the fertile loam and deep vegetable mould. It is, in general, most barren on the coast, and richest and most productive on the banks of the rivers, till towards their termination. The banks of the Hawkesbury and Macquarie are particularly fertile, especially after inundations, which, like those of the Nile, supply the place of artificial manure. The general climate of New South Wales is warmer than that of the south of Europe, but salubrious and congenial to the European constitution. To understand its peculiarities, it must be recollected that it is situated nearly on the opposite part of the globe, comparing it with the north-west of Europe. Of course, its seasons, though corresponding in nature, are at contrary periods of the year. December, January, and February comprehend the summer quarter, during which the heat is usually intense, and the thermometer ranges between 60° and 90°. At this season tempests are frequent and violent. March, April, and May are the months of autumn, which sets in very hot and rainy, but grows gradually milder and serene towards the conclusion of May. The heat during this quarter varies from 55° at night to 75° at noon. The winter includes June, July, and August, during which the mornings and evenings are very chilly, and the nights often so extremely cold as to occasion ice half an inch thick, though the mean temperature of winter is 40° to 45° in the morning, and from 55° to 60° at noon. The remaining months constitute the spring quarter, when the height of the thermometer varies from 50° to 70°. In the latter end of spring the weather becomes hot, dry parching winds prevail, and storms of rain and hail, with thunder and lightning, are not uncommon. The prevailing diseases are those of the chest and bowels, particularly consumption and dysentery; but it is said that the usual infantile epidemics, such as small pox, measles, and hooping-cough, are unknown.

Natural history.---The natural productions of this country exhibit a great and interesting variety; many of them are highly valuable, and some of them are of a very singular description. The principal minerals hitherto discovered are granite, limestone, freestone, slate, coals, and iron; and topazes of great beauty are occasionally found. The granite is often seen in insulated masses of considerable size at a great distance from the mountains. The limestone is of good quality, and the freestone and slate well adapted to the purposes of building. Iron-ore abounds in every part of the country, and is in some places remarkably rich, so as to produce nearly three-fourths of its weight of metal. Coal has hitherto been found most abundantly on the banks of the Coal river, and is in general of good quality.

The variety of plants is so great that above 4000 species, of which more than half are peculiar to the country, have been described and classed. Some of the most remarkable are, the species of *eucalyptus* or gum-tree, which form some of the largest timber yet discovered, having been seen of the height of 150 feet, and from 25 to 40 feet in girth near the root; the tribe called *banksia*, the *leafless acacias*, the *casuarinæ*, well adapted to ship-building, the *nutmeg-tree*, very feebly aromatic, and the *cephalotus follicularis*, or pitcher-plant. Great part of the country is covered with timber of a gigantic growth, including mahogany, cedar, and rose-wood; and even the coasts display an infinite variety of flowering shrubs and plants, many of which are of great beauty.

But the most singular productions of New Holland are seen in the animal kingdom. Here we find the *kangaroo*, a quadruped of beautiful appearance with very long and strong hind legs, which enable it to leap to an amazing distance, so as with difficulty to be overtaken by the fleetest greyhound, and having a ventral pouch for sheltering its young; the *wombat*; numerous species of the *opossum* tribe; dogs like jackals; and that curious anomaly of the animal creation the *ornithorynchus*, or duck-billed animal. There are also several very singular birds, as black swans and white eagles, a kind of parrot with webbed feet, the *emu*, a gigantic species of cassowary, and the *menura superba*. Of the birds known in this country, wild ducks, teals, widgeons, quails, pigeons, plovers, snipes, and most of our smaller birds, are found; but partridges and pheasants are unknown. Of British fish the most common are the skate, sole, mackerel, mullet, whiting, john-dory, eel, and smelt; a peculiar species of perch inhabits the rivers; and the seas furnish spermaceti and other whales, and many fish strangers to our coasts. Many poisonous insects, reptiles, and serpents, are said to occur; but as among them travellers enumerate the centipede and tarantula, it is probable that these accounts are exaggerated. Turtle and oysters are abundant.

Population.---Scarcely any country has yet been discovered so thinly peopled as New Holland. Large tracts of ground have been traversed without meeting a single inhabitant, and, when seen, they are generally in small parties, seldom exceeding 20 individuals. But the colonists from this country now amount to a considerable number, as, according to a late census, the British population, in 1818, exceeded 25,000, consisting partly of convicts, partly of the civil and military establishment, and partly of free settlers who have emigrated from Europe for the purposes of agriculture or commerce.

Natives.—The natives of this country are described by most travellers as occupying the lowest place in the scale of the human species. They are of middle stature; in general thin, but tolerably well made. Their features are ugly, their skin black or dark brown, and their intellect inferior to that of most savages. They either go entirely naked, or are covered only with an opossum's skin; they construct no habitations, except forming a shed with pieces of bark; they seem totally unacquainted with agriculture, and many of them even with fishing. They are armed with spears and lances, in the use of which they are very dexterous, and employ a rude kind of buckler as a defence against the weapons of their savage opponents; but the implements with which they administer to their support in hunting or fishing are of the rudest contrivance and workmanship. They are cruel and vindictive, and never forgive or forget an injury. They are the least gallant of any savages with whom we are acquainted, wooing their mistresses with blows, and often punishing their wives with death for slight offences. So little do they seem susceptible of improvement, that an intercourse of 30 years with Europeans has effected very little change in their habits and manners. Even those who have intermixed with the colonists have seldom been prevailed on to practise the usual arts of civilized life, and, disdaining the restraints of society, place all their happiness in their original pursuits; and though by no means insensible to the superior enjoyments derived from civilization, appear to regard them as a poor compensation for even a partial sacrifice of their natural liberty. But however rude and barbarous these savages may be, they have some sense of religion, tinctured indeed with much superstition. They worship a supreme being, and believe the doctrine of a future state. They bury or burn their dead, and observe funeral rites; but their worship is imperfect, and their ceremonies superstitious, and often ridiculous. They resemble the negroes of Guinea in many particulars, but in others are so different from the inhabitants of all other known countries that it is difficult to trace their origin. They are distinguished rather into families than tribes, and their chiefs or patriarchs have the title of Be-ana or father. Their language is melodious, but their vocabulary scanty.

Divisions.---The whole continent may be divided into three parts; the British colony of New South Wales occupying the eastern side, and now gradually extending itself to the north and towards the interior; the western part, to which some geographers give the distinguishing name of New Holland; and the central parts lying between the two former, and as yet scarcely explored. To these divisions may be added the island of Van Diemen's Land. The principal subdivisions or districts of New South Wales, are *Sydney*, *Paramatta*, *Windsor*, *Illewarra*, *The Coal River*, *Botany Bay*, and *Bathurst*; and the following are the principal towns.

Sydney, the capital of the colony, is situated chiefly on two hilly necks of land, and an intervening valley forming Sydney cove, on the southern side of Port Jackson, in S. lat. 33° 55′, and E. lon. 151° 25′. Its western side extends to the water's edge, and its southern side stretches back towards the interior. Its appearance, though lately much improved, is rude and irregular. The houses are in general low, and distinct from each other, having each a considerable piece of garden-ground. The principal building is the governor's house; but there are some respectable dwelling-houses belonging to private individuals.

The public institutions are, a good market, a bank, with a capital of L.20,000. Two good public schools, besides some private seminaries, and the New South Wales institution, the printing-office, and the Auxiliary Bible society. The land in and about Sydney, though of bad quality for culture, is extremely valuable for building, and produces, when sold, about L.1000 per acre. The population exceeds 7000 persons.

Paramatta stands at the head of Port Jackson harbour, about 16 miles above Sydney, along a small fresh water stream which flows into the river Nepean. It consists principally of one street about a mile long, and is surrounded to the south by a chain of hills. It is much behind Sydney in the appearance of its buildings, though it contains some of good and substantial construction. Among the public buildings are a church, a government-house, a jail, two orphan-houses, an hospital, a school for the education of the native children, which is said to be making some progress, and two good inns. The number of inhabitants is about 1200, who are employed chiefly in agriculture and commerce. Two fairs are held half-yearly, in March and September. The value of land is about 200 per cent. lower than at Sydney.

Windsor is situated near the confluence of a branch of the Hawkesbury, called the South creek, with the main stream of that river, on an elevated hill rising 400 feet above the level of the water. It contains a church, government-house, court-house, public store-house, barracks, a jail, and an hospital, but none of them deserves particular notice. The houses are mean, and, like those of Paramatta, built of wood, but among them is an excellent and even splendid inn. The population amounts to about 600, chiefly farmers and inferior traders and artizans. The Hawkesbury is of considerable size, and navigable for vessels of 100 tons burden four miles above the town. The land in the vicinity is rich and rents higher than at Paramatta.

Liverpool, a small town containing 200 or 300 inhabitants, stands on George's river, about 18 miles to the south of Sydney. The only public buildings are, a church, a school-house, and warehouses for public stores. The neighbouring land is of indifferent quality.

Newcastle stands at the mouth of the Coal river, about 60 miles to the northward of Sydney. The ordinary population is about 550, but, except a company of soldiers, and a very few families of free settlers, its inhabitants consist of incorrigible convicts, who, for aggravated offences, have been retransported thither to work in fetters in the coal-mines and lime-works, and in felling timber for the public works at Port Jackson. The coal is easily procured from superficial veins, and the timber, which is chiefly cedar and rose-wood, is of excellent quality; but the lime is made from immense beds of oyster-shells, and is therefore inferior to what is produced from limestone. As the country in the vicinity of Newcastle forms one of the finest settlements in New South Wales, nothing but their being kept to hard labour can render transportation thither an adequate punishment to offenders; and it is understood that a new settlement for that purpose is to be established in the interior, far to the west of the Blue mountains.

Bathurst, a small town lately formed in the district so called, on the river Macquarie, is rapidly improving, and contains a few hundred inhabitants employed in agricultural pursuits, to which the surrounding country is admirably adapted, as the soil is good, the ground level, and particularly suited to pasturage. Bathurst is 180 miles to the west of Sydney, and a regular communication between them has been opened across the mountains.

The Government of the British colony and its dependencies is strictly military, and consequently despotic, being vested in a governor and lieutenant-governor, who are officers in the army of superior rank, assisted by a judge-advocate and a small council. The governor-in-chief, who is also vice-admiral and commander of the forces, resides at Sydney, and the lieutenant-governor in Van Diemen's Land. Justice is administered by five courts, namely, the court of Vice-admiralty, which takes cognizance of captures, salvages, and other matters of dispute respecting property on the high seas, but has no criminal jurisdiction; the court of Criminal Judicature, consisting of the judge-advocate and six military or naval officers, which tries all criminal offences, and adjudges the adequate punishment, according to the law of England; the Governor's court, formed of the judge-advocate and two inhabitants of the colony, which hears civil causes of debt and other pecuniary matters under L.50 Sterling, without appeal to other courts; the Supreme court, composed of a judge and two magistrates, before whom are brought all pleas relating to matters exceeding L.50 Sterling, with an appeal to the high court of appeals. In this last court the governor presides, assisted by the judge-advocate, and its decisions are final, except when the matters in dispute exceed L.3000, when appeals lie to the executive government at home; but, from the difficulty and expense attending such appeals, they are in general nugatory.

State of defence.—The military and naval force maintained in these colonies is very small; by no means sufficient to overawe such a turbulent set of beings as form the bulk of the population, much less equal to repel the invasion of a foreign enemy; and its efficiency is materially lessened by the manner in which it is dispersed in small parties among the different settlements.

Agriculture and horticulture.—The system of agriculture followed in New South Wales does not differ materially from that of Britain. Plough husbandry is generally practised, except in new lands, where the use of the hoe is unavoidable for the first year. Both horses and oxen are employed for draught, but the latter are cheaper than the former. The prevailing crops are wheat, maize, barley, oats, and rye, but the first two are the most cultivated. Wheat is sown from February to July; but April, May, and June are considered the best months. Barley and oats are sown with most advantage in June, and maize is planted chiefly in October. This last produces the most abundant crop, averaging from 80 to 100 bushels per acre. Wheat harvest commences in November, and is generally finished by Christmas; but maize is not ripe till the end of March, and is not completely gathered before the end of May. The rearing of cattle is simple, economical, and profitable, as they are left to range in open pastures, under the superintendance of a herd; but sheep are confined during the night within inclosures, to protect them from the native dogs. The raising of artificial grasses for winter fodder is now generally adopted, and the making of hay begins to prevail. Turnips, tares, and coarse barley are also cultivated; but potatoes are seldom planted in the open field.

All the vegetables usually cultivated in the British gardens thrive in New South Wales, but not all equally well. Cauliflowers, brocoli, and peas, attain a superior degree of perfection; but potatoes and beans, especially the latter, are apt to degenerate. Most of the European fruits, particularly peaches, apricots, nectarines, oranges, and lemons, and cherries, mulberries, walnuts, chesnuts, almonds, medlars, quinces, grapes, figs, plums, pears, and melons, attain the highest maturity in the open air; but the climate seems unfavourable to the apple. Peaches in particular, though of excellent quality, are produced so abundantly as to be employed in feeding hogs.

Manufactures and commerce.—In an infant colony like that of New South Wales, it could scarcely be expected that manufactures should be yet established to any considerable extent, were it not recollected that the population is composed in a great measure of manufacturers and artificers, whom want of work, extravagance, or natural indolence, have impelled to commit trespasses which, though not subjecting them to capital punishment, have incurred the penalty of transportation. In fact, few colonies of the same standing can boast of so many manufactures. The colony already contains extensive works for making coarse woollen cloths, hats, pottery, salt, soap, and candles, besides large breweries and tanneries; and blacksmiths, nail-makers, tin-men, rope-makers, cabinet-makers, wheel-wrights, gig-makers, and many other artificers and mechanics, find sufficient employment, and some of them have considerable capitals embarked in their several departments, and manufacture to a great extent. It is supposed that the capital vested in these colonial manufactories is not less than L.50,000.

The trade and commerce of the colonists are at present inconsiderable, since they have few articles of export to offer in return for the various commodities supplied by the countries with which they have established a commercial intercourse. These countries are chiefly Britain, the Cape of Good Hope, the East Indies, and China; and, as the trade is confined principally to the importation of such articles as are required in the colony in exchange for the money expended there by government, the balance is clearly against the colonists. One staple article of exportation, *wool*, is likely soon to turn the scale, and others, derived from the whale fishery, might become very lucrative, were it not for the narrow policy which forbade the colonists to engage in that profitable employment farther than was sufficient for their own consumption. When certain restrictions, to be afterwards mentioned, shall be removed, the trade of the colony will be greatly extended and improved, and of course its prosperity will be proportionally increased.

The state of society among the colonists is much more favourable than could be expected, considering the individuals of whom it is composed. The most respectable and select circles are of course formed by the civil and military officers and their families, who, in the large towns, frequently meet in parties, have public balls, and sometimes races; but except these there are no public amusements, and the theatre which was once established has been given up. Among the colonial sports must be mentioned coursing the kangaroo and emu, for which parties are often made to the interior, where they remain for some weeks, living on the animals they run down. Shooting and fishing are also practised, but not to any great extent.

State of literature.—In a colony like that of New South Wales, it cannot be expected that literature should have been cultivated to any extent; and yet the appearance of a work so respectable as Wentworth's description of the colony, which has gone through two editions in as many years, shows that it is not entirely neglected. It has already been shewn, that the education of youth has met with encouragement; and the liberal grant made by government for supporting schools, and providing for the children educated in them, must materially contribute towards that important object. Printing presses have been established for some years; a weekly gazette has been published at Sydney almost ever since the establishment of the colony; and two or three other newspapers are regularly sent to this country. An Australasian quarterly magazine has also been commenced.

History.—Although there can be little doubt that some part of the coast of New Holland was seen by Spanish and Portuguese navigators before the conclusion of the 16th century, there is no authentic record of its having been explored previous to the year 1606, when the northern coast was visited by the Dutch navigator Tasman. But he failed in showing its separation from New Guinea, to which it was long supposed united. Several visits were afterwards made during the 17th century by Dutch navigators, by whom the western coast was explored to a considerable extent, and names given to several parts of it, which are retained by modern geographers.

In the latter part of the 17th century New Holland was first visited by the English. The celebrated adventurer William Dampier examined the northern and north-west coast, and communicated respecting them information which has been very little extended or improved. But it was not till 1770, when our great navigator Cook visited New Holland, during his first voyage round the world, that any precise or accurate ideas could be formed respecting the outline and insular nature of that great continent. He examined the whole eastern coast, from cape Howe to cape North; discovered many of the inlets, especially Botany Bay; and ascertained, beyond a doubt, that this continent was divided by water from New Guinea.

New Holland.

It was again visited in 1773 and 1777 by Captain Furneaux, and Captain Cook; and Van Diemen's land, then thought to form a part of New Holland, was discovered.

When, in consequence of the successful revolt of the American colonies from the dominion of Britain, the usual place of transportation of convicts had been lost, the eyes of the British government were turned towards New Holland, as a suitable situation for that purpose; and though the distance and expense of such a colony were material objections, it was at length resolved to form such an establishment at Botany bay. Accordingly, in May 1787, a fleet of 11 ships, properly equipped, having on board 760 convicts and a small military force under the command of governor Phillip, sailed from Portsmouth, and, in January 1788, after a prosperous voyage of eight months, arrived at Botany bay. It was soon found that this harbour had been selected for the seat of the new colony without sufficient knowledge of its capabilities for that purpose, and the fleet proceeded farther north to Port Jackson, which was much better calculated for a permanent residence and for the reception of shipping. Here, then, a debarkation took place, temporary buildings were erected, and the foundations of Sydney, the capital of the future colony, were speedily laid.

At the period of commencing the settlement the number of persons who were to form its new inhabitants amounted to about 1060, and they had brought with them 5 horned cattle, 7 horses and mares, 29 rams and ewes, and 74 hogs. The cattle were suffered to go at large, and soon became wild, and in the course of a few years, increased to a very large herd.

In about four years from the establishment of the colony, the town of Sydney had begun to assume a respectable appearance, and many houses had been erected at Paramatta. But the prosperity of the colony was long impeded by the irregularities and depredations of the convicts, and their continual disputes with the natives. In 1792, Governor Phillip left the colony, and, for the time, was succeeded by Lieut.-governor Grose. At that time, besides the land in cultivation under the immediate inspection of government, about 700 acres were parcelled out among 60 free settlers, and the colony began to assume a more respectable appearance, though still in a state of great insecurity, and often threatened with all the horrors of famine. In 1794, a new settlement was formed on the banks of the Hawkesbury river. In 1795, Governor Hunter succeeded to the command of the colony, and established the first printing-press. At that time, the public stock amounted to 227 horned cattle, 57 horses and mares, 1531 sheep, 1427 goats, 1869 hogs, and 5419 acres of land were in cultivation. In the beginning of 1800, the public stock had increased to 1044 cattle, 203 horses and mares, 6124 sheep, 2182 goats, 4017 pigs, and the quantity of arable land in cultivation amounted to 7677 acres. The inhabitants of New South Wales and Norfolk island, which had been colonized in 1788, but was afterwards abandoned, had increased to 6000. In 1801, Governor Hunter left the colony, and was succeeded by Mr King.

New Holland.

While the British colony was thus increasing in numbers and advancing in prosperity, many important discoveries were made respecting the geography of Australasia. The French admiral, D'Entrecasteaux, had examined and accurately surveyed the harbour on the southern extremity of Van Diemen's land; and our countrymen, Captain Flinders and Mr Bass, had, in 1798, ascertained that this land is an island separated from the continent by a considerable strait. The same discovery was afterwards extended by the French officer Baudin; and, in consequence of the shameful detention of Captain Flinders in the isle of France, the important information derived from these visits was first communicated to the public by the French.

In 1801, though the number of the inhabitants had not much increased, the live stock amounted to 1293 cattle, 243 horses and mares, 6757 sheep, 1259 goats, and 766 hogs; and the number of cultivated acres was about 11,000. During this year the colonists were alarmed by the shock of an earthquake, which, though it did little mischief, threw the settlement into great consternation for fear it should be followed by some serious catastrophe. By this time, too, it had been discovered that the farms established on the Hawkesbury were rendered less valuable from the sudden and uncertain inundations of that river, which sometimes rose near a hundred feet above its ordinary level, carrying desolation on every side. One of the most destructive of these inundations took place in 1801, and, besides laying waste the land of the settlers in that district, occasioned the loss of some lives.

In 1804, a serious insurrection arose among the convicts, but was quelled by the prompt exertions of the governor. This insurrection originated among some Irish convicts, and was suppressed with the assistance of a Roman catholic priest of the same nation.

Governor King was succeeded by captain Bligh, so well known as the commander of the Bounty, whose crew mutinied and took possession of the vessel. This officer's government proved highly unpopular; and if the picture given of it by Mr Wentworth can be implicitly relied on, deserves to be stigmatized as one of the most tyrannical and oppressive that was ever imposed on any colony. It became at last so intolerable, that the lieutenant-governor found it necessary to exert a discretionary authority, and put his superior under arrest. This change took place in the beginning of 1808; and soon after Governor Macquarie arrived from Britain, and has ever since continued to preside over New South Wales and its dependencies. About the time of this gentleman's arrival in the colony, nearly 12,000 acres were in cultivation either as arable farms or gardens; and the live stock consisted of 9004 cattle, 948 horses, about 33,250 sheep, 2975 goats, and 18,800 hogs.

All fear of famine, except from occasional drought and inundations, had long since ceased, as the quantity of corn produced was more than sufficient for the supply of the inhabitants, and, from the want of a market for the overplus, had even accumulated in the granaries. Manufactures were beginning in flourish, and trade to assume a favourable aspect. Since the appointment of Governor Macquarie, the colony has flourished more than at any former time; new settlements have been formed; many improvements introduced; and some important geographical discoveries have been made. The intercourse between the colonists and the natives has been more successfully carried on; and several of the native children, with the consent of their parents, have been received into the colonial schools, and have exhibited a capacity and docility scarcely to be expected.

Before describing the present state of the colony of New South Wales, it is proper to give a brief abstract of the late journies into the interior which led to the discoveries already alluded to, and thus complete this historical sketch of the origin and progress of the colony.

Between November 1813 and January 1814, inclusive, the country to the west of the Blue mountains was first accurately examined by Mr Evans, deputy-surveyor. He crossed the mountains from Emu island, in the Nepean river, and found the range to stretch above 40 miles from east to west. On clearing the mountains, he discovered that branch of the Macquarie river which, from the abundance of fish found in it, he denominated the Fish river; and, before reaching Bathurst plains, he fell in with another branch joining the former, and which he called Campbell's river, the two branches forming the main stream of the Macquarie; after this union rolling along a mighty river to the north-west, through a fine, level, open country, abounding with kangaroos and emus, but almost destitute of human inhabitants. In this expedition, Mr Evans extended his researches westward for 154 miles; and in a second journey, in 1815, he traced the Macquarie for about 115 miles, and was able to see its course 30 or 40 miles farther, tending towards a range of blue mountains.

These discoveries induced Governor Macquarie to visit the western territory in person, and to establish a depot at Bathurst. As it became an object of great public interest to ascertain the course and termination of a river so important as the Macquarie, a new expedition, under the superintendence of the surveyor-general, Mr Oxley, was fitted out in 1817, with the view of ascertaining these points, as well as to determine whether the Lachlan were a branch of the Macquarie or an independent river.

Mr Oxley left Sydney in the beginning of April, and, after completing his stores and equipments for the journey at Bathurst, reached the river Lachlan, which he was first to examine, on the 25th of that month. He proceeded down the river till the 12th of May, and found that the country rapidly descended till the waters of the river rose to a level with it, and, dividing into numerous branches, inundated the country for many miles, so as to prevent his proceeding any farther in the direction of that branch, the waters of which appeared to be lost among marshes. He therefore proceeded towards the other main branch, which he traced through a perfectly level country, extremely barren, till the 8th of July, when its banks became so low, and the stream so stagnant, and confounded with marshes and lagoons, that it was evident it had ceased to be a running river. He was now five hundred miles to the west of Sydney, and 150 miles from the nearest part of the coast, and had proved that no river could fall into the sea in that direction. After this disappointment he directed his course north-westerly, in order to reach the Macquarie, which had been seen by Mr Evans; and after traversing a desert region, in which he and his party were exposed to great fatigues, and were often in danger of perishing for want of water, on the 7th of August he reached a country of a very different aspect, high and open, abounding with good timber and excellent pasturage, and affording plenty of the animals on which the natives usually subsist. On the 10th, he had the satisfaction to encounter a stream running northerly. He gradually came to a fine luxuriant tract, well watered with numerous streams; and on the 19th of August fell in with a larger stream, which led him to the main river, which proved to be the Macquarie, and fully justified the opinion that had been formed of it. But as his resources were now exhausted, he was compelled to abandon the enterprise for the present, having ascertained one of the points which he had been instructed to investigate, that the Lachlan no where united with the Macquarie, but was an independent solitary stream, running in a very circuitous rout for about 1200 miles, till it was lost in marshes.

Mr Oxley's second expedition took place in 1818. By the beginning of July, he had traced the course of the Macquarie for some hundred miles beyond the point at which he had quitted it in 1817, and found that it gradually diminished in depth, and expanded in breadth, till, on the third of that month, when in lat. 30° 45′ S. and long. 147° 10′ E. it suddenly lost the character of a river, and spread itself on all sides from N. W. to N. E. over a plain covered with reeds with a bottom of blue mud. He saw a ridge of high mountains about eighty miles to the eastward, towards which he bent his course, after ascertaining the impracticability of getting round the vast expanse of water either to the N. W. or N. E. On the 8th of August, he reached the mountains, and enjoyed from their summit a most extensive and interesting prospect of the surrounding country. He observed that this mountainous range stretched to the N. E. by N. at least 120 miles. Proceeding eastward from this range, he traversed a rich and fertile tract well watered with several fine streams, till on approaching within fifty miles of the coast in lat. 31°, 30′ S. he encountered another range, exceeding in elevation any that had yet been discovered in New South Wales. Crossing these mountains, he discovered the source of the river Hastings, and pursuing its course, arrived on the 8th of October at port Macquarie, having in the last three months passed over a tract of country nearly 500 miles in extent from west to east.

In 1819, an important point was gained by the colonists situated on the opposite sides of the Blue mountains, in the discovery of a more circuitous, but much less difficult and inconvenient route between Sydney and Bathurst, than across those mountains. This discovery was made by Mr Charles Throsby, a considerable land and stock-holder on the Sydney side, in April and May. Mr Throsby crossed the Nepean, and directed his course through the cow pastures which lie to the west of that river, and winding round the southern side of some high mountains which appear to form the sources of some of the branches of the Nepean, turned to the north through a beautiful open country, well watered and extremely rich, to Sidmouth and Macquarie's plains, and thence to Campbell's river in the neighbourhood of Bathurst. This newly discovered tract promises to form a most desirable spot for agricultural pursuits, being well adapted both to pasturage and tillage, and, from its vicinity to navigable streams, offers every conveniency for transporting its produce to market.

The present state of the colony is highly gratifying, and affords a prospect, not only of its soon becoming so far independent of the mother country, as that much of the enormous expence at which it was formerly maintained may be avoided, but even of assisting its parent by furnishing many productions, as wool, timber, spermaceti, and oil, which are essential to her manufactures, her safety, or her comforts. In the course of one year, (from 1817 to 1818,) the number of European inhabitants had increased above 5000, and it is probable that at this time the population cannot be less than 30,000 individuals. These settlers are now spread over an immense extent of country, and, according to the latest accounts, 290,600 acres of land are in actual cultivation, or have been cleared. The quantity of live stock is also so much increased, that, according to a lively reviewer, " the inhabitants of New South Wales have now before them 2000 years of cheap beef and mutton." At the conclusion of 1818, there were in the colony 55,450 horned cattle, 3,600 horses, 201,240 sheep, and 22,630 hogs, besides a large stock of goats and poultry. The price of these articles, and of provisions in general, is of course very moderate. Good unimproved land may be purchased on an average at about L.5 per acre; a good horse or ox for draught, at from L.5 to L.10; breeding ewes from L.1 to L.3; a very good milch cow at L.8 or L.10. Beef and mutton of good quality sell for 6d. per lib., veal at 8d. and pork at 9d. Wheat brings about 8s. or 9s. per bushel; oats 4s., barley 5s., maize 5s. 6d. Potatoes, poultry, eggs, and butter, are dearer than in this country; potatoes selling for 8s. per cwt., (about 2s. per peck) fowls 4s. 6d., ducks 6s. per couple, a goose 5s., a turkey 7s. 6d.; eggs 2s. 6d. per dozen, butter 2s. 6d. per lib.

The colonists have at length found markets for the surplus of their stock. They have lately exported horses to Batavia, cattle and salted meat to the Isle of France, and flour to the Cape of Good Hope, and have begun to freight vessels with wool, seal-skins, oil, and spermaceti for Britain.

The affairs of the colony, and the civil and commercial disadvantages under which it long laboured, have, within this last year, attracted the serious attention of Parliament; and, in consequence, the administration at home have been induced to concede several privileges, and remove some restrictions.

The arbitrary nature of the colonial government, and especially its power of imposing taxes by the immediate authority of the governor, had been justly complained of; and Mr Wentworth, a strenuous advocate for the liberties of his native country, has proposed that, to remedy these evils, a house of assembly, and the English form of trial by jury, should be established. This proposal has very properly been ridiculed as premature, since, among a population such as that of New South Wales, it can scarcely be expected that a sufficient number of respectable jurymen could be assembled at any one point of the colony, much less that a sufficient number of intelligent and independent individuals could be collected to form a representative assembly. But government has gone as far as the nature of circumstances would allow, and has appointed a colonial secretary as a check on any despotic measures of the governor, and has agreed that the power of taxation hitherto exercised by the local government should be abandoned, and should, for the future, rest only with parliament. Until last year no vessels belonging to the colony of less than 350 tons burden could trade between New Holland and the mother country, or its dependencies; but by an act of the legislature, passed in July 1819, that trade has been thrown open to vessels of all descriptions. The duties on oils procured by colonial vessels engaged in the Southern whale fishery had been removed, and that lucrative branch of commerce may now be carried on to any extent. It is farther understood, that the governor is to be assisted by a council, and that the privilege of internal distillation is to be conceded to the colonists.

With respect to this last concession, there is much contrariety of opinion between the moralist and the politician. The former argues strongly for withholding it, on the grounds that many of the enormities which have already taken place among the convicts have been traced to drunkenness; and that it would be better altogether to withhold this fascinating poison, than to increase the facility of procuring a liquor capable of producing such extensive mischiefs. The latter contends, that where men can procure spiritous liquors at all, (and to prevent their introduction into the colony from ships trading has been found impracticable,) they will sacrifice even the necessaries of life to obtain them; that the very difficulty of procuring them enhances their value in the eyes of the profligate and idle; and that it is even not desirable that the poor labouring man should be withheld from solacing his cares and refreshing his bodily fatigues and exhausted spirits by a glass of gin or whisky, while the wealthy gentleman procures the same advantages from his pint of port or his bottle of claret. One of the best arguments in favour of colonial distillation is, that as the quantity of corn produced among the colonists is obviously greater than they can consume in the form of bread, while they are at too great a distance from civilized nations to export it advantageously, the interests of the agriculturists require that it should be disposed of in some other way; and that in cases of scarcity, which may still occur from occasional drought or inundations, the stores of grain laid up for the distilleries would furnish an ample resource for the public wants. Add to this, what, as a political argument, has always been of weight in this country, such internal distillation would materially increase the revenue, and diminish the expence of supporting the colony.

Reflections.----In estimating the importance of New South Wales as an appendage of the British empire, it may be considered in two lights; as a place of transportation for convicted felons, and as a colony of free settlers from Britain; and it is obvious that these considerations are, in some measure, at variance with each other.

As a place of transportation, it is liable to many serious objections. Its great distance, at one-half the globe, from the principal seat of government, not only exposes the convicts, and the crews of the vessels which convey them, to many dangers from sickness and tempests, by which many lives have been lost, and renders the intercourse between the two countries difficult and precarious, but materially increases the enormous expence at which such an establishment must always be maintained. It is calculated that, from its first establishment to the year 1815 inclusive, this settlement has cost the British nation not less than L.3,465,983; and though this expence is gradually diminishing, (the sum paid by government for the transportation and maintenance of convicts during 1815, having been only L.150,000,) it must still for many years be a considerable burden on the public. Of the amount of the expenditure on the part of government for the last five years, we have no accurate information; but, as the necessity for carrying out more provisions than are sufficient for the voyage is now done away, by the abundance in the colony, it must be considerably less than the sum expended in 1815.

Two other material objections to New Holland as a place of transportation naturally present themselves. Such a settlement should not only be a place of punishment, but should, as far as possible, be a school of reform; but, in both these respects, New South Wales is deplorably deficient. Transportation has long ceased to be regarded as a punishment by the worthless and indigent part of the British community; and of late, when the distresses of the labouring poor have so much increased, it has been considered a beneficial change to be sent from a country where they can with difficulty support themselves and families, to one in which they are supported at the public expence, and are pretty sure, if they conduct themselves properly, to obtain an advantageous settlement. It is not uncommon for criminals who receive sentence of transportation to express their joy on the occasion, and some of them have been heard exclaiming to their acquaintances, "What a glorious kangaroo hunt we shall have when we get to Sydney!" As a school of reform for the convicts themselves, the settlement is evidently nugatory, as the greater the number of depraved characters that are collected together, the more must vice and depravity abound. But this is not the only disadvantage of such an establishment. As it is impossible to effect a perfect separation of the convicts and the free settlers, the morals and manners of the latter must suffer from the contaminating influence of the former; and accordingly, we learn from the best authority, that in spite of the religious instruction of worthy clergymen, the exertions of missionaries, and the establishment of a bible society, the settlement of New South Wales is still a sink of iniquity and den of thieves.

As a colonial settlement, New South Wales offers many advantages, though they are materially diminished in value by the circumstances just mentioned. Land of good quality, to any extent, and such as may be easily cleared, is to be obtained at a cheap rate, or as much may be procured gratis as would cost L.400 in America. The settler is allowed as many servants, taken from the convicts, as he may require, at one third of the wages he must pay in the United States. For the first six months after his arrival he and his family are supplied with provisions gratuitously from the public stores. The expense of emigration is also moderate; it is calculated that a man, his wife, and two children, may transport themselves to Port Jackson for about L.100, including every expense, provided a whole ship could be freighted at the rate of five tons to such a number for themselves and baggage, and that a single individual might be conveyed thither for L.30. It has been shewn that the air is mild, the climate salubrious, and provisions cheap; and the native inhabitants, though not more desirable neighbours than savages generally prove to new settlers, are easily kept off by an inconsiderable number of men furnished with fire-arms. On comparing New South Wales as a place of colonization with the United States, with Canada, and with the Cape of Good Hope, the first possesses most advantages in respect of agriculture, the feeding of cattle, and especially the breeding of sheep for wool, while it labours under the greatest disadvantages in respect to its society.

An account of Van Diemen's land forms a natural supplement to a description of New Holland.

Van Diemen's Land, the principal island in the immediate neighbourhood of New Holland, lies between 41° and 44° of S. lat. and between 144° and 149° E. long. It is about 160 geographical miles miles long and 145 broad. In its general aspect it surpasses the continent, as it exhibits a pleasing variety of hill, dale, and valley, lofty forests and open meadows, watered by numerous streams. Its outline is marked with numerous indentations, some of which form harbours superior in extent and commodiousness to any in the world, such as Port Derwent on the south, D'Entrecasteaux's harbour on the west, and Port Dalrymple on the north.

This island rises in some places into considerable elevations, the highest of which is the Table mountain, supposed to be 6000 feet in perpendicular height. It has, proportionally, more rivers than the continent. The principal are, the Derwent, which falls into the bay of the same name, and the Tamar, that flows northerly into Bass's strait through the medium of Port Dalrymple, and receives in its course the north and south Esk, and the Lake river. There are several lakes in the interior.

The productions differ little from those of New Holland; but to the minerals already enumerated are added alum, asbestos, basaltes, and copper, though the last has yet been found only in small quantity. An extensive bed of coal, above three feet thick, resting on freestone, occurs at the southern extremity. Of the vegetables found on the continent, here are wanting the cedar, mahogany, and rose-wood; but this deficiency is in a great measure supplied by black-wood, and a kind of yew called the Huon pine, which latter is remarkable for its odoriferous smell and extreme durability. The dog of New South Wales is unknown; but a large quadruped like a panther, though terrified at the sight of man, commits dreadful havoc among the flocks. Besides the birds common in New Holland, a delicious species, called the *wattle* bird, is found in this island. The reptiles are neither so numerous nor so noxious as on the continent. The fish and other marine animals are much the same, but mussels are more plentiful than oysters.

The soil and climate of Van Diemen's land are, on the whole, superior to those of New Holland; and much of the land being naturally clear of timber and even underwood, and being of good quality and sufficient depth, much previous labour is saved to the cultivator.

The natives of the island differ from those of the continent in having woolly hair; they are still less civilized; they have no idea of fishing, have no canoes, and their weapons are clumsy and inconvenient.

The island is divided into two principal districts, Hobart-town and Port Dalrymple; and the principal towns yet established are Hobart and George-town. *Hobart*-town, the first of this settlement, and which was long the capital of this subordinate colony, stands about four miles from the mouth of the river Derwent. It is built chiefly upon two hills, between which is a fine stream flowing through the town into Sullivan's cove. It consists only of a few wooden houses, lathed and plastered within, accommodating about 1000 inhabitants, and has no public building deserving particular notice. George town is a recent establishment near Port Dalrymple, begun only five or six years ago; and it is intended to transfer thither the seat of government, formerly fixed at Launceston, a small town, or rather village, in the neighbourhood. Launceston is about 160 miles from Hobart-town, and there is a road of communication between them.

There is only one court of justice for the two settlements in Van Diemen's land; it is called the Lieutenant-governor's court, and takes cognisance only of civil causes within L.50; all other civil, and all criminal causes, are carried before the proper courts of Sydney. Only two companies are kept for the defence of the whole island; so that the inhabitants have been repeatedly exposed to the depredations of run-away convicts, who at one time composed a formidable banditti.

The only difference in the agriculture of this island from that of New Holland is, that maize does not succeed owing to the lower temperature, while the wheat is of superior quality. Many of the fruits which arrive at great perfection on the continent do not come to full maturity; but apples, currants, and gooseberries, thrive well. Sheep and cattle are more easily reared, and attain a greater weight than in New Holland; and there is no necessity for providing winter-fodder. The price of provisions is nearly the same as about Port Jackson, but the price of labour is higher. Manufactures have as yet been little cultivated; and the commerce is similar to that of the continental colony. The internal and coasting trade of the island is much facilitated by the numerous navigable streams and extensive harbours with which it abounds. The island has been colonized about 18 years; and, in consequence of its advantages, as ably pointed out by Mr Wentworth and others, it is likely soon to become more populous and flourishing in proportion than New South Wales, by the emigration of new settlers.

HOLLAR, Wenceslaus, an eminent German engraver, was born in 1607, and died in 1677, in England, where he spent the latter part of his life. See Design.

HOLOCAUST, derived from the Greek, and signifying *whole burnt offering*, denotes that kind of sacrifice the whole of which is consumed by fire. Such sacrifices are alluded to both by sacred and profane writers.

HOLOGRAPH, a term derived from the Greek, and denoting that a deed is entirely written by the hand of the person who subscribes it; as for example a will or testament in the hand-writing of the testator, is said to be a holograph writing.

HOLOSTEUM, a genus of plants belonging to the Triandria class.

HOLOTHURIA, a genus of animals belonging to the class Mollusca, and arranged under the order Vermes. See Helminthology.

HOLSTEIN, a duchy or province of Denmark. See Denmark.

HOLYHEAD, a sea-port town on a small island contiguous to the island of Anglesea in North Wales, and the station of the regular packets between Dublin and England; seems to be a place of great antiquity, and consists of one principal street. For the accommodation and amusement of strangers, a hotel on a large scale, assembly rooms, and baths, have been erected. The harbour, formed by the projecting cliffs, and protected by a small island on which a light-house has been built, has received some very material improvements of late years; and to the westward of the South Stock, another light-house has been erected. A narrow channel, fordable at low water, divides the island on which Holyhead is situated from Anglesea. The population of Holyhead exceeds 3000; and the inhabitants are chiefly employed in fishing, in taking the eggs of sea-fowl from the cliffs, or in catching the birds themselves, and in the service of the packets established for the conveyance of the Irish mails.

HOLY ISLAND, an island on the Northumberland coast in England, but belonging to the county of Durham. The distance from the coast is about two miles, but at low water the island is accessible by a sand bank stretching from the north western extremity to the mainland. Holy island is about nine miles in circumference, and the surface is little elevated above the level of the sea. The extent of arable land has been greatly increased by inclosing, and the rent of the island has been tripled of late years. The village, inhabited chiefly by fishermen, is on the west side of the island, and the small harbour is defended by a battery. The population is estimated at nearly 700; and the industry of the inhabitants is occupied in fishing, agriculture, and domestic manufactures.

But Holy Island, as the name imports, derived its chief consequence from its religious establishments. It was originally the Episcopal seat of the see of Durham. The see was instituted in 635; but after a second visit from the Danes in 875, the bishop and the inhabitants, carrying with them the remains of St Cuthbert, the patron saint, left the island, and, after a pilgrimage of several years, fixed their residence at Chester-le-Street, and finally at Durham. The ruins of the monastery, priory, and offices, are still visible. The parish church is a spacious Gothic structure; and the parish of Holy-Island, which is sometimes called Island-shire, includes several chapelries on the mainland. In the limestone rocks of Holy-island, the animal remains called St. Cuthbert's beads, *entrochi* of naturalists, are abundant.

HOLYWELL, a town of Flintshire in North Wales, contains more than 6000 inhabitants, and is celebrated for a remarkable spring in the vicinity, called St. Winifred's well, which discharges such a quantity of water as to form a powerful stream to drive different kinds of machinery. See Flintshire.

HOMBERG, William, a chemist of considerable eminence, was born in 1652 in the island of Java in the East Indies, where his father, a German, was engaged in the Dutch service. Young Homberg, on his father's return to Europe, studied at several German universities; and at Magdeburg was admitted to the bar, about the time that Otto Guericke, the celebrated inventor of the air-pump, was occupied in experiments with that instrument. This led him to the prosecution of natural philosophy. He afterwards studied medicine at Padua, visited other parts of Italy, and passed through France to England, where he remained some time engaged in experimental enquiries with Mr Boyle. Having travelled through other countries of Europe, and having acquired much chemical knowledge, he returned to Paris; and at the solicitation of the great Colbert, he settled in that metropolis. The regent Duke of Orleans, to facilitate his chemical investigations, erected and furnished a splendid laboratory. Homberg died in 1715. He contributed numerous memoirs to the Transactions of the Academy of Sciences, or to different departments of natural philosophy. Many of his labours were directed to an examination of the properties of phosphorescent substances, some of which still retain his name.

HOME, Henry, commonly known by the title of Lord Kames, an eminent Scottish lawyer and celebrated author, was the son of Mr George Home of Kames, in the county of Berwick, where he was born in the year 1696. His education, till the time of his entering college at Edinburgh, was committed entirely to the care of a private tutor.

As soon as young Home was capable of reflection and of judging for himself, he perceived that he could trust to nothing but his own efforts; for his father's circumstances had gradually fallen into embarrassment. Being therefore anxious for improvement, and eager in the pursuit of knowledge, he found no difficulty in removing permanently from Berwickshire to Edinburgh, where for some time he attended the chambers of a writer to the signet, with the view of becoming himself a solicitor or attorney, and in that capacity practising before the Supreme Court. But circumstances soon opened to him brighter prospects; and he determined to become an advocate as soon as his years and the progress of his studies permitted. Meanwhile, he attended several of the classes in the university, and devoted a considerable portion of his time to the study of metaphysics,—a study for which he had a strong predilection, and in which he made no small proficiency.

When he came to the bar in 1724, he found he had many rivals in this road to opulence and preferment; and accordingly his success was at first but moderate. Indeed, Mr Home seems never to have been remarkable as a public speaker; in his law papers, that energetic style, and that close and ingenious reasoning, for which he is so celebrated, must be sought for. When, therefore, by the publication of his "Remarkable Decisions of the Court of Session from 1716 to 1728," his talents became more generally known, his success in his profession rapidly increased. Pleased with the reception given to his first professional publication, he from time to time produced other collections of a similar nature, which were all very favourably received. Noticing only the more important productions of so voluminous an author, we refer the reader for fuller information to Lord Woodhouselee's excellent life of this great man.

In February 1752, Mr Home was appointed one of the judges of the Court of Session, and took the title of Lord Kames. In this new situation, he was honoured and admired, as well for the unremitting attention he paid to business, as for the great judicial talent and sacred regard to justice which he never failed to display. At the same time he was always fond of society, and loved to indulge his social habits. The morning and greater part of the day he commonly devoted to law, and in the evening amused himself with cards, conversation, or polite literature.

In the meantime the Abridgement of the Statute Law of Scotland, Historical Law Tracts, the Principles of Equity, and various other works on subjects of Scottish jurisprudence, came successively from his pen; all of which, at least in Scotland, acquired a popularity equal to that of the professional labours of Coke or Blackstone in England.

His first work on any subject of more general interest appeared in 1751, and is entitled "Essays on the Principles of Morality and Natural Religion." In this volume several doctrines were taught, which were either obscurely expressed, and consequently misunderstood, or were really intended to convey the meaning that most readers attached to them. Be this as it may, his peculiar sentiments and opinions on these subjects were for some time classed with those of Hobbes and Collins of preceding times; and many works soon appeared to confute the reasoning he had employed. In a second edition he judiciously altered many of his obnoxious expressions, but in the third, it is not a little remarkable, that they reappeared in their original form. In 1762 was published his "Elements of Criticism," a work distinguished not only for the instruction it affords, but also for its classical composition, and the agreeable manner in which a subject naturally dry and uninteresting is treated. It soon became a standard work, and has continued so ever since.

In 1763 he was appointed one of the commissioners or lords of justiciary, and thus his judicial labours were considerably increased. But, delighting in mental exertion, by a proper distribution of his time he not only discharged all his duties to the public, but had leisure for other pursuits, particularly for that of agriculture, to which he paid considerable attention, and even published a treatise upon it of great merit, entitled "The Gentleman Farmer." Lord Kames having succeeded in 1766, in right of his wife, to the extensive property of Blair-Drummond, was probably led to direct his attention to rural affairs. In the agricultural operations on his own estate he introduced many improvements of very great importance; and among the many proofs of his excellence as a landlord, was that of the love which all his tenants bore him in return for the mild and affectionate manner in which he always delighted to treat them.

In 1773 "Sketches of the History of Man" made its appearance, which, by the variety of useful matter the work contained, and the skilful manner in which the subject was digested and arranged, still farther increased, if possible, the fame which Lord Kames had already acquired.

"Loose Hints upon Education, chiefly concerning the Culture of the Heart," was the work that closed his literary career. At the time of its publication he was eighty-five; and though it certainly cannot boast all that vigour of style and power of intellect which are found in most of his other productions, yet it is a performance which, had he never written any thing else, would have stamped him as a man of genius.

The debility attendant upon extreme old age was now rapidly gaining upon him. He complained, however, of no particular disease, and he still continued to rise at the early hour of six, though two hours later than he had observed during the greater part of his life.

The last day of his appearance in Court presented an affecting scene. The venerable judge and instructive writer, warned by an exhausted constitution of the approaches of death, took a solemn farewell of each of his colleagues. This event, strongly marked with a soothing melancholy, and at the same time exhibiting the noble triumph of a vigorous intellect over the frailties of mortality, he survived about a week, and then closed, in 1782, a long life of nearly 87 years.

Of Lord Kames's character there is only one opinion. If we regard him in his private and domestic life, we are delighted with his various virtues, and the innumerable little traits of an amiable disposition and benevolent heart. As a judge, the impartiality and decision, and at the same time the extreme gentleness, with which he conducted himself, impress us with feelings of admiration and esteem; whilst his profound knowledge of his profession, and the singular acuteness of intellect with which he exercised it, will, to say nothing of his various celebrated works upon subjects of jurisprudence, long preserve his memory in honour. As a man of letters, the great reputation of his "Elements of Criticism," and other literary publications, sufficiently distinguishes him. As a private gentleman, he was beloved by every one, and his society eagerly sought, not only by philosophers and the learned, but by all, of whatever age or sex, who had once observed the ease and affability with which he accommodated himself to every one around him. With the gay he was lively, and with the serious, grave. But it was not his manners and disposition alone that endeared him to society; his charitable actions were numerous though not indiscriminate, and the delicacy with which he relieved the unfortunate was equally obliging as his beneficence itself. It is also remarkable, that he never interfered with politics, not even when party-spirit rose to the greatest height. With regard to his religious opinions much has been said, and he has often been attacked on this head. But whatever may be conjectured from some passages in one or two of his works, we are assured by all who knew him, and particularly by his respectable biographer, that he uniformly entertained a deep sense of the value of religion, and a true and devout veneration of the Deity; and that this was really the case, seems manifest by the whole tenor of his actions.

HOME, John, the celebrated author of "Douglas," a tragedy, and of other dramatic pieces, was the son of Alexander Home, town-clerk of Leith, and was born at that place in 1722; and having received the elementary part of his education at the grammar-school of his native town, he completed his academical studies at the university of Edinburgh, which could then boast of many names that afterwards shone conspicuous in the literary history of their country, as Dr Robertson, the historian, Dr Wilkie the author of the Epigoniad, Dr Blair, Sir Gilbert Elliot, Sir John Dalrymple, and some others. Mr Home being destined for the church, passed through the usual theological course, and was licensed to preach in the beginning of the year 1745, when the flame of civil war was about to burst out. The ardour of the young divine did not permit him to remain altogether an idle spectator of the disastrous events which then threatened the country. He joined the armed association for the defence of the city of Edinburgh; but this military body being rendered unnecessary by the occupation of the metropolis by the troops of the Pretender, was dissolved in a week from its first formation. Mr Home, still ambitious of military glory, entered another company of volunteers, and obtained the rank of lieutenant; and the company having received the commander in chief's permission to serve in the field, marched to Falkirk, and under Mr Home's command, without orders to take any part in the engagement, saw the king's veteran troops defeated by a raw and undisciplined body. Home, and some of his company, on their return to Edinburgh, were taken prisoners by the rebels, and conveyed to Downe Castle, from which they escaped after two weeks confinement.

In the following year Mr Home was settled as minister of Athelstaneford, a country parish in East Lothian; and in this charge he was the immediate successor of Robert Blair, the author of the highly popular poem "The Grave." From his mode of life, it seems probable that Mr Home was not over zealous in the discharge of his clerical functions; for it is said that he was absent from his lodgings during the greater part of the week, visiting his friends in the parish or neighbourhood; and his agreeable manners and fascinating address made him every where a welcome guest.

Among his intimate companions, Mr Home was long known as a votary of the tragic muse; and in the year 1749, he finished his first dramatic composition, the tragedy of Agis, the story of which is derived from Plutarch; and having been fortunate in obtaining the approbation of his literary friends, he made a journey to London for the purpose of having it represented on the stage; but the author was not a little disappointed and mortified, to find that the critics of the south discovered too many faults and defects in the piece to encourage him to hope for a favourable reception from the public; and Garrick, guided probably by the opinion of those who were regarded as the arbiters of public taste, refused to afford him an opportunity of having its merits fairly tried before a London audience. This failure, however discouraging, had not the effect of making the poet relinquish dramatic composition. Soon after his return to Scotland, it is presumed, he commenced the tragedy of Douglas, the hint of which was taken from the old song of *Gil Morris*; but when it was offered in 1755 to the London theatres for representation, it shared the fate of its predecessor, in being rejected by Garrick. In the succeeding year Douglas was brought forward on the Edinburgh stage, and having met with great applause, drew together crowded houses; and thus an Edinburgh audience had the credit of fixing the character of a drama which has ever since retained its popularity. The success of the play at Edinburgh induced the manager of Covent-Garden to try its merits before a London audience, and it was received with similar applause, although Garrick still persevered in its exclusion from Drury-Lane.

The appearance of the tragedy of Douglas may be regarded as forming a remarkable era both in the literary and ecclesiastical history of Scotland. It is the only tragedy the production of a Scottish author that still retains its place on the stage, and it drew forth from different parties of the church of Scotland the expression of very opposite sentiments concerning the lawfulness and tendency of theatrical amusements. Many of the author's friends of the clerical profession had been present at the representation of Douglas; and this being considered altogether incompatible with the gravity of their character, they were attacked in numerous pamphlets, and were threatened with the censures of the church for their supposed licentious conduct, while nothing short of deposition was reserved for the author himself. After a keen literary warfare, the matter terminated with the author resigning his charge, and a declaration of the General Assembly, the highest church court, prohibiting the clergy from attending the theatre. The strictures thus excited have been variously appreciated, even in the present day. Approved by some as agreeable to an unrepealed law of the church, they have been denounced by others as the dictates of a furious spirit befitting only the agents of a Spanish inquisition. But the illiberal prejudices that prevailed about the middle of the eighteenth century may perhaps admit of some apology, when it is known that some of the members both of the Episcopal and Presbyterian churches of the kingdom, have revived the controversy concerning the immorality of the stage as late as the year 1818, when a discourse against its evil tendency was delivered from the pulpit in the north of England; and with the same view, a clergyman of the Scottish metropolis has preached and published sermons in which the tragedy of Douglas is particularly alluded to as unfit for a serious Christian to see represented. With such recent examples in our own times, the severity of censure on the illiberality of former ages must be softened and modified.

Mr Home resigned his ministerial office in 1757, and perhaps found little difficulty in adopting this measure, as he seemed ever afterwards anxious to divest himself of his clerical habits, a remarkable instance in which is recorded, his appearance in the General Assembly in military uniform, when he held the rank of lieutenant in a fencible regiment. This silly piece of vanity was unworthy of one who had sat as a clergyman in the same court, and it was unworthy of the author of Douglas. The resignation of Mr Home was immediately followed by a pension of L.100 a year from the Princess Dowager of Wales. In 1762, through the interest of Lord Bute, the king granted him a pension of L 300 a year; and soon afterwards the appointment of conservator of Scots privileges at Campvere, with an emolument of equal value was bestowed upon him.

In his visits to London, Mr Home became more closely connected in friendly intercourse with Garrick; and through the exertions of the inimitable actor, the proscribed Agis, improved by the author, was brought on the stage, and acquired a temporary celebrity. *The siege of Aquileia*, *The Fatal Discovery*, *Alonzo*, and *Alfred*, the remaining productions of Mr Home's tragic muse, also obtained a short-lived applause. *The History of the Rebellion in Scotland in* 1745, the last literary labour of Mr Home, appeared in 1802. Of this work great expectations were entertained; but equally great was the disappointment of the public. It seems obviously to have been composed during the author's declining years; and, as a historical investigation, it discovers no merit that the industry of an ordinary writer of the present day might not secure. The latter years of Mr Home's life were spent in Edinburgh, where he died in 1808, when he had reached the 86th year of his age.

HOMER, the first and still the chief of epic poets, flourished according to some in the tenth century before the Christian era, or about 300 years after the taking of Troy, and according to others in the eighth century before Christ. Equally uncertain is the place of his birth. Seven towns of Greece have disputed for that honour, but the point remains unsettled. Homer is represented as being blind, a misfortune which, some suppose, befel him in his old age, and as having wandered in indigence and in the capacity of a minstrel throughout Greece, reciting his poems in the different cities, and at the courts of the petty princes of the time.

The ingenuity of criticism has been long engaged on the subject of the Iliad and Odyssey of Homer, with the view of ascertaining whether the different parts of these epic compositions were the work of one author; whether they were a fortuitous assemblage of detached rhapsodies connected together at a later period,—or whether they were originally formed on a regular and determinate plan, constituting a complete whole. The different parts of these poems, it is considered certain, were scattered throughout the towns of Greece and Ionia. According to Plutarch, the whole were brought by Lycurgus from Asia to Greece; and the arrangement in their present order is ascribed to Pisistratus. Celebrating the patriotism and deeds of valour of the heroes of Greece, the poems of Homer became highly popular in that country; the veneration for Homer was transmitted without diminution to the most refined periods of the Roman power; and the sublimity of genius, the fertility of invention, and the glow of enthusiasm which pervade his writings, have obtained for him, down to the present day, the lofty appellation of the *prince of poets*. The Iliad and Odyssey are regarded, by the more judicious critics, as the only genuine works of Homer; the "Battle of the Frogs and Mice," is generally rejected; and the "Hymns" are considered of doubtful origin. The editions of Homer are almost innumerable. The English reader has access to his works in the polished translation of Pope, as well as in the later and closer attempt of the same kind by Cowper.

HOMICIDE, a law-term, which denotes the taking away of any person's life; and is either *justifiable*, when it arises from unavoidable necessity, and when it is committed for the advancement of public justice, or for the prevention of crime; *excusable*, when it happens by misadventure or in self-defence; and *culpable* or *felonious*, when it is perpetrated from previous intention, thus constituting the crime of murder, or, when a less degree of blame is attached to the deed, coming under the denomination of manslaughter.

HOMILY, a sermon or discourse composed in a plain and familiar manner, so that it might be understood by the common people, and distinguished from the studied and more elaborate harangues delivered from the pulpit. In the early period of the Christian church, homilies were compiled by the bishops for the use of the clergy, whose learning was inadequate for such compositions. In the first ages of the church, the bishops only preached. The practice of compiling homilies commenced about the end of the eighth century, and was introduced under the authority of Charlemagne.

HOMOGENEOUS, a term derived from the Greek, and denoting that all the parts of any body are of the same kind, in opposition to *heterogeneous*, which indicates that they are of a dissimilar kind.

HOMOLOGATION, a law term, signifying the recognition or acknowledgment of some act or deed in addition to the conditions formerly agreed to, and thus rendering it more obligatory, as in cases where some of the conditions are actually performed by the contracting parties.

HONAN, one of the central provinces of China, is described as the most delightful region of that vast empire, is highly cultivated, and abounds in corn and fruits. This province is traversed by the great river Hoang-ho, and is watered by numerous smaller streams.

HONDURAS, a Spanish province of Guatimala in America, stretches along the coast, and is deeply penetrated by a bay of the same name, which has been long famous for the production of logwood and mahogany. See Guatimala.

HONEY, a sweet vegetable juice collected by bees from the flowers of plants, and deposited in their combs. See Bee.

HONEY-DEW, a saccharine substance secreted by the leaves of trees and deposited on their surface. It has been observed on the leaves of the oak, the lime, and the bramble.

HONFLEUR, a sea port town of the department of Calvados in France, stands on the banks of the Seine, and has a commodious harbour.

HONITON, a town of Devonshire in England, which has a population exceeding 2700, with manufactures of lace, and some trade in butter.

HOOGHLY, one of the branches of the Ganges in Hindostan, and forming the port of Calcutta, is not the largest branch, but having the greatest depth of water is the most convenient for navigation. See Hindostan.

HOOKE, Robert, an eminent English philosopher, was the son of a clergyman in the isle of Wight, was born in 1635, and early discovered a mechanical genius by making curious toys. He was educated at Westminster school, under the celebrated Dr Busby, and completed his academical studies at Oxford, where he was employed as an assistant in the chemical operations conducted in the university, and was afterwards engaged in the same capacity by Mr Boyle, to whom he also contributed some valuable improvements in the construction of the air-pump; while the invention of several astronomical instruments for making observations both at sea and on land, established his reputation for mechanical knowledge. When the mechanic school was founded by Sir John Cutler, Mr Hooke was appointed lecturer, with an annual salary; and about the same time he was elected by the Royal society curator of experiments, with a salary also attached. After the great fire in London in 1666, he presented to the Royal society a model for rebuilding the city; but although it met with the approbation of that learned body, as well as of the lord mayor and aldermen, it was not carried into execution. But he was employed as one of the surveyors in setting out the ground to the proprietors; and in this business it is understood he amassed a large fortune.

In 1677 Mr Hooke was appointed secretary to the Royal society; and in 1696 an order was granted to him for repeating most of his experiments at the expence of the society, on condition of the observations and deductions from these experiments being completed, and a full description given of the instruments he had invented; but the increasing decay of an enfeebled constitution frustrated the performance of these important duties. He died in 1702.

Many of the features in the character of this profound philosopher, it is much to be regretted, are far from being amiable. His person being deformed, exhibited a mean appearance and a meagre aspect; and his temper was penurious, cynical, vain, and suspicious. He thought himself the only man who could invent or discover; and it is said he frequently claimed the inventions and discoveries of others. His published works are the following:—*Lectiones Cutlerianæ*, or Cutlerian Lectures, the substance of the lectures delivered in London; *Micrographia*, or descriptions of minute bodies made by magnifying glasses, which also contains observations on respiration, the composition of the atmosphere, and the nature of light; a description of Helioscopes; *Lampas*, or a description of some mechanical improvements of lamps and water poises; Philosophical Collections; and Posthumous Works, collected from his papers.

Among the other inventions and discoveries of Dr Hooke, are enumerated his application of the barometer as a weather-glass,—a'scapement for maintaining the vibration of a pendulum, and the balance-spring for watches,—the double-barrelled air-pump,—the conical pendulum—an engine for cutting clock and watch wheels,---the nature of capillary attraction,—the freezing and boiling of water at fixed temperatures,—a quadrant by reflection,---the marine barometer,---and a gauge for sounding great depths,---the steam-engine on Newcomen's principle,—and a plan for a telegraph.

HOOKE, NATHANIEL, author of an elaborate Roman history, was born about the end of the 17th century, and died in 1764. The first volume of his Roman history appeared in 1733, and the fourth and last volume was not published till 1771, some years after his death. He was also the author of other works connected with Roman manners and Roman affairs. But, in one view, his most remarkable production is an Account of the Conduct of the Dowager Duchess of Marlborough, from her first coming to Court to the year 1710, in a letter from herself to Lord —— in 1742, a labour for which he was rewarded with the enormous sum of L.5000. A quarrel afterwards took place between the author and his employer, because, being a Roman catholic, he had attempted to convert her to popery. Mr Hooke also published a translation of Ramsay's Travels of Cyrus.

HOOKER, RICHARD, a learned divine of the church of England, was born near Exeter in 1553, and received his education at Oxford, while he was chiefly supported by an uncle and the bishop of Exeter; was afterwards elected fellow of his college, and appointed deputy-professor of the Hebrew tongue in the university. Having entered into holy orders, he was appointed to preach at St Paul's Cross in London; and, in consequence of his visits to the metropolis, was drawn into an unfortunate marriage, in consequence of which he lost his fellowship, and was some time without a benefice. He was afterwards presented to a rectory in Buckinghamshire, and obtained a more valuable preferment in the appointment of master of the Temple. He was presented, at his own desire, in 1591, to a rectory in Wiltshire, and a prebend's stall in the cathedral church of Sarum, that he might be more at leisure to carry on the great work in which he was long engaged; and was afterwards removed to a rectory in Kent, where he died in the year 1600.

Mr Hooker is chiefly known for his elaborate treatise "of the Laws of Ecclesiastical Polity," the first four books of which were published in 1594, and procured for the author a high reputation both at home and abroad for his extensive learning, great piety, and moderation. This work met with the approbation of Pope Clement VIII.; the fifth book was published in 1597; and the last three appeared after his death.

HOP, HUMULUS LUPULUS, *Lin.* a plant of great importance in the manufacture of malt liquors, was brought into England from the Netherlands in 1524, and is now extensively cultivated in the southern counties, particularly in Kent and Essex. For an account of the properties and uses of this plant, see BREWING; and for an account of its mode of culture, the reader may consult the Agricultural Reports of Kent and Essex.

HOPEA, a genus of plants belonging to the Polyadelphia class, was so named by Linnæus in honour of the late Dr Hope, the zealous professor of botany in the university of Edinburgh.

HORACE, QUINTUS HORATIUS FLACCUS, the celebrated Roman poet, was born at Venusium, 65 years before the Christian era. He was the son of a freedman, who was employed in the humble capacity of a tax-gatherer; was instructed in all those branches of education which were thought necessary for youth of higher condition, and was sent to Athens to study the literature and philosophy of the Greeks. Having entered the army, he was present at the battle of Philippi as a military tribune; but he acquired little glory in the single campaign in which he was engaged, while he had the misfortune of having his property forfeited, although he obtained his pardon. His poetical talents procured him the friendship of Virgil and Varius, and through their recommendation he was honoured with the patronage of Mecænas, the great encourager of learned men. By his influence, the estate of the poet was restored, while he himself became a favourite with Augustus, and was offered the post of private secretary to the emperor, an office which he declined, from his love of independence. Rome, his Sabine villa, and Tarentum, on account of its mild climate, were the usual places of his residence; and he seems to have lived much among persons of rank. He died in the sixth year before the Christian era, and in the 59th of his age.

The writings of Horace were held in high estimation during his life; the classical scholar need not be informed of the undiminished reputation he yet sustains as a lyric poet and satirist; and in his didactic compositions he delivers many excellent moral maxims, and many just observations on human life. The English reader may in some measure appreciate the beauties of Horace in the prose translation by Smart, or in the more agreeable poetical version of Dr Francis.

HORDEUM, Barley, a genus of plants belonging to the Triandria class.

HORIZON, from the Greek, and denoting a limit or boundary, is a great circle of the sphere, dividing it into two parts; and is called *rational* horizon when the divisions are equal; *sensible*, or *visible*, when a lesser circle of the sphere divides the globe into unequal parts.

HORN, a hard substance growing on the heads of quadrupeds, and applied to many useful purposes in the arts and domestic economy. For the manufacture of horn, see Ivory and Horn Manufacture.

HORNBLENDE, a species of mineral. See Geology.

HORNE, George, a learned English prelate, was a native of Kent, and was born in 1730, was educated at Oxford, and having early distinguished himself by his progress in oriental literature, was elected to a fellowship in 1749. About this time, he entered the lists in the controversy regarding *Hutchinsoniasm*, and wrote in defence of the mysteries promulgated by Mr Hutchinson in opposition to the Newtonian philosophy. Mr Horne was afterwards chosen president of his college, appointed one of the chaplains to the king, and was finally elevated to the vice-chancellorship of the university, and promoted to the deanery of Canterbury. The influence thus acquired, easily paved the way to a still more conspicuous station in the church in 1790, when he was advanced to the episcopal dignity, and obtained the see of Norwich. But, from this time, his health declined rapidly, and he died in 1792.

Dr Horne was a zealous opponent of the peculiar tenets of David Hume; and, on this subject, he published first a letter to Dr Adam Smith, containing strictures on his account of Mr Hume's death; and afterwards, with the same object in view, letters on infidelity. He was not less zealous in his opposition to the alterations proposed in the corporation and test acts. On this point his liberality will be questioned by some, while his steady adherence to the church will meet with the applause of others. But the "Commentary on the book of Psalms," which appeared in 1776, in 2 volumes 4to, furnishes the best proof of the profound learning and warm piety of the author. Four volumes of sermons, two of which are posthumous, are also enumerated among the works of bishop Horne.

HOROLOGY.

Horology, a term derived from two Greek words, signifying a *Discourse on Time*, is that branch of mechanics which explains the construction and uses of *time-keepers*, more particularly such as are composed of toothed wheels, connected together and set in motion by a weight or a spring, including *clocks* and *watches*. The consideration of *dials* belongs to Dialling. A treatise on this subject includes a *description* of clocks and watches, with the view of explaining the names, situation, and uses of their several component parts; an account of the most approved *contrivances* for regulating their movements, and rendering them as far as possible exact measurers of time, with the *principles* on which this action depends; *instructions* for managing and keeping in order those machines; an account of the *uses*, besides merely keeping time, to which they may be applied, and a *history* of the origin and progress of so useful and ingenious an invention.

The art of measuring time, by such complicated machines as clocks and watches, is deservedly considered the most ingenious, if not the most useful, of all the mechanical arts, and well merits the attention of all who admire the sagacity with which the mind of man could contrive, or the patience and dexterity with which his hand could execute them. The construction of a watch, in particular, the works of which are so delicate, and are brought within such a narrow compass, that the whole machine sometimes does not exceed the size of a shilling, is truly wonderful, and affords a striking proof of what genius, aided by science, can effect. Well may the moralist, in illustrating his arguments for the divine creation of the world, select this contrivance as an instance of design. We can scarcely wonder that the ignorant and unenlightened savage, on first seeing a watch, should take it for an animal endued with life as well as motion, or the god whom the white man worships.

In the present treatise, it is intended to describe the practical construction of clocks and watches; and to give such a comprehensive view of the subject as may enable the general reader to understand their mechanism, appreciate the value of the improvements they have undergone, and manage and regulate them, under ordinary circumstances, without the usual assistance.

Chap. I. On the Construction of Clocks and Watches.

General Construction.—Clocks and watches agree so far, in general construction, that they are both composed of a series of toothed wheels, the axes of which are inserted in holes or depressions in metallic plates, which, being joined together by pillars, constitute the frame; while they are connected with each other by their teeth in such a manner as, when acted on by certain powers, to produce a steady and nearly uniform motion, by which certain indexes or *hands* are carried round a dial-plate, and point out the regular lapse of time. Sometimes the construction of these machines is so similar, that they are to be distinguished chiefly by their size; so that a small table clock, and a large watch or time-keeper, differ very little from each other. But, in general, clocks are distinguished from watches by two circumstances; by the former regularly striking the hours, and having their motion produced by *weights* and regulated by a *pendulum*, while the latter either never strike the hour, or do so only when part of their machinery is set in motion, and have for their moving and regulating forces *springs*, a *verge*, and a *balance*.

In more minutely describing these machines, they may be considered as formed of four principal parts or divisions; the *frame*, the *dial*, the *works*, and the *case*.

The *frame* is composed of two metallic plates joined together by four pillars, which keep them parallel to each other, and allow between them such an interval as is just sufficient for lodging most of the works. The two plates are so joined as to be easily separated, and may readily be distinguished from each other by the large central hole in the front plate or that next the dial; while to the back plate is generally fixed a part called the *potence*. The frame of a clock is generally rectangular; that of a watch circular.

The *dial-plate* on which the hours, minutes, and sometimes seconds are drawn, is either metallic, or consists of a metallic plate covered on both sides with enamel. (See *Enamelling* under Glass Manufacture.) It is pierced with a central hole corresponding to that in the front plate of the frame; and in clocks or watches that shew seconds, it has another hole above or below the former. In the dial-plate of a clock, there is generally a hole below the centre for shewing the day of the month, and also a hole on each side of the centre for admitting the arbors by which the clock is wound up; and the dial-plates of single-cased watches have a single hole for the same purpose. In adjusting the dial-plate to the front plate of the frame, sufficient space is left for certain wheels which turn the hands, and in some clocks for other machinery.

The *works*, which form the movement of clocks and watches, are more or less complicated according as the purposes to be answered by these machines are more or fewer. In a common watch that merely *shews* the hours and minutes, they are most simple; but they are very complex in repeating watches or musical clocks. They may be divided into the *moving power*, the *chronometrical apparatus*, the *regulating power*, and the *striking apparatus*. The moving power in ordinary clocks is a weight suspended by a cord, generally of strong catgut, one end of which is fixed to a cylindrical barrel, while the other, passing below a pulley that supports the weight, is brought upwards, and secured above a hole in a shelf which supports the frame. The barrel is fixed on an axis that turns freely in two opposite holes of the frame; and its surface has a spiral groove in which the cord coils round when the clock is wound up. The weight acting by its gravity pressing on the last coil of the cord, draws it down, and thus turns round the barrel and sets in motion the works connected with it. In watches, and in some clocks, hence called spring-clocks, the moving power is an elastic steel-spring, coiled up within a cylindrical box, and having one end fixed to an axis that passes through the centre of the box, while the other is fixed by a hole in the circumference of the box. From the box proceeds a small chain or cord which coils round a spiral groove, in a conical piece of metal called the *fusee*, also turning on an axis, one extremity of which forms an arbor for winding up the machine. By this operation, while the chain is coiled up on the fusee, the spring within the box is put on the stretch, when by its elasticity, gradually relaxing itself, it draws round the box and fusee, and the chain is by degrees transferred to the box. The motion of the fusee, like that of the barrel in the former instance, is propagated to the chronometrical apparatus, and continues till the machine goes down, by the chain being all wound off the fusee, and by the relaxation of the spring.

Ratchet-wheel.—If the weight of the spring were allowed to exert its full power of gravity or elasticity, the cord or chain would be speedily uncoiled and the machine would *run down*. This inconvenience is partly prevented by the contrivance of a *ratchet-wheel*; that is, by a wheel having its circumference cut into teeth that are a little concave on one side. This wheel is fixed by a square hole on that extremity of the axis of the barrel or fusee, which is opposite to the arbor, and must necessarily move round with the barrel or fusee. It is contiguous and concentrical to another wheel, also fitted to the same axis, but by a round hole, so that in winding up the machine, the axis, with the ratchet wheel, moves freely round without interfering with the other wheel; but in revolving in the contrary direction, in the regular motion of the machine, it is prevented from turning without the other wheel by a *click* or paul which is fixed to that wheel, by a single pin, so as to catch the concave edge of the teeth of the ratchet wheel. This contrivance, which is frequently used in wheel machinery, is represented at Fig. 3. of Plate 103.

The proper *chronometrical apparatus* is composed chiefly of wheels and *pinions*, that is, small wheels either formed out of solid metal on the axis of a larger, or formed separately and fitted to that axis. The wheels are distinguished by particular names according to their size or importance, their situation, and the position of their teeth. Thus the wheel already mentioned as attached to the barrel of a clock or fusee of a watch, is called the *great* wheel, not so much from its size as its importance in impelling the rest. The teeth of this wheel act on the *leaves* (or teeth) of a pinion on the axis of the second wheel as it is called, though from its situation in the centre of the machine it is more properly called the *central-*wheel. It is fixed on an axis that plays in a hole or depression in the centre of the back plate of the frame, while the other extremity passes through the central hole in the front plate, and terminates in a square arbor, on which is fixed the socket of the minute hand. In ordinary clocks and watches, there is a *third* wheel, the pinion of which is impelled by the teeth of the central-wheel, while its teeth act on the pinion of the *fourth* wheel, which generally forms part of the *regulating* power. The rest of the chronometrical apparatus is situated between the frame and the dial-plate, and consists, 1st, of a small wheel fixed on the arbor of the centre-wheel, close to the front plate of the frame; 2d, of a wheel whose teeth are acted on by the former, while its pinion, called the *pinion of report*, acts on, 3d, a wheel furnished with a cylindrical socket, placed on the axis of the centre wheel, and bearing the hour-hand. This assemblage of wheels and pinions is called the *dial-work*.

The *regulating power* consists of the *pendulum* or *balance*, with its moving or regulating apparatus. Proceeding in the description commenced above of the general mechanism, the next part to be noticed is the *contrate*-wheel, connected with the third wheel, It revolves on an axis which, like the former, plays between the plates of the frame; but its teeth are placed in a different or *contrary* position. The wheels before described are formed of a circular plate of metal, having the teeth cut on its circumference; but the principal part of the contrate-wheel consists of a narrow cylinder or hoop of brass, on the posterior edge of which the teeth are cut; so that, though the wheel and its pinion revolve in the same plane with the former wheels, its teeth act in a perpendicular direction on the pinion of the next wheel. This last wheel is called the *crown*-wheel, or in watches the *balance*-wheel. It is something like the contrate, except that the teeth, instead of being rectangular, are triangular and oblique, resembling those of a ratchet-wheel. Its axis plays between two opposite plates or bars of the potence in clocks, or within a depression in the middle part or *nose* of the potence in watches, and has a pinion with long leaves that work in the teeth of the third or contrate wheel. In some clocks the third wheel is not a contrate wheel, but its teeth are like those of the great and centre wheels, and it acts in a similar direction.

So far the mechanism of clocks and watches is very similar; but what is now to be described shews some important differences. These differences are particularly important in what is called the *'scapement*, or that part of the regulating power which impels and limits the motions of the pendulum or balance, and most effectually prevents the machine from *running down*,

A *'scapement* in its simplest form is composed of a crown or balance-wheel, and a lever furnished with projecting parts called *pallets*, which are made alternately to hitch between and *escape* from the teeth of the wheel. The ordinary clock 'scapement is thus formed. The *swing* or *scape-wheel*, as it is called in this case, is situated a little behind the front plate of the frame; and immediately above its teeth hangs an arched or angular piece, called the *crutch*, the extremities of which bear the pallets. From the upper part of the crutch a wire proceeds backwards through the back plate of the frame, and is there united at right angles with another wire, which terminates in a perforated piece through which the pendulum passes. These two wires constitute the *fork*, which, as it is moved to one side or the other by the mutual action of the crutch and scape-wheel, carries the pendulum along with it. The diagram at Fig. 4. shews how the pallets and teeth of the scape-wheel act on each other, and will be afterwards illustrated.

The *common pendulum* consists of a round, double-convex piece of metal, of considerable weight, called the *bob*, suspended by a metallic wire about 30 inches long. To the upper end of this wire is screwed a square piece of brass, from which extends upwards a long flexible plate of metal, ending in a button. The pendulum being introduced through the hole of the fork, is carried up till the button be opposite a projecting piece above the top of the fork, and the flexible plate being inserted in a slit, the pendulum is thus suspended. In some clocks, the horizontal arm of the fork is furnished with two simple pallets, which are alternately acted on by the teeth of the crown-wheel, which, in this case, is a contrate wheel and turns horizontally. See Fig. 1. This construction is now seldom used.

In a common watch, the balance consists of a circular thin rim of steel, with three spokes uniting in the centre, where is a hole by which the circle is fixed on one extremity of an axis carrying two pallets, and called the *verge*. That extremity or *pivot* of the verge which bears the circle or balance properly so called, passes through a hole in the back plate of the frame, and is received into a depression in a separate plate called the *cock*, which is screwed on the frame so as to cover but not press upon the balance, and the other pivot of the verge plays in a depression in the *foot* of the potence. Besides the mutual action of the pallets of the verge and the teeth of the crown-wheel, which impels the balance round first one way and then the other, the motion of the balance is farther regulated and limited by a slender spring, which, having one extremity introduced within a hole in a kind of box on the axis of the verge, is coiled into a spiral below the balance, and has its other extremity thrust through a hole in a stud fixed to the frame, and also passes through a cleft in an arm that passes between the spring and a graduated moveable circle near the cock, which from its action on the spring is emphatically called the *regulator*.

Fig. 9. illustrates the relative position of the balance and crown-wheel. R R is the balance in perspective; N N the crown-wheel, seen from behind; and *c*, *d*, the pallets of the verge. Fig. 10. explains the arrangement of the spiral spring below the balance, and its connexion with the regulator. R R is the balance; *a*, *s*, the spring; *p* the point of insertion of its outer extremity; *r*, R, the regulator, with its arm *a* extending to the last turn of the spiral. This figure shews how the regulator acts by shortening or lengthening the spiral spring, according as the arm *a* is moved along it, farther from or nearer to the point *p*. But this will be better understood by a subsequent part of this treatise.

Figs. 1. and 2. illustrate the above description, so far as it relates to clocks. Fig. 1. shews the moving part of a clock in profile. A B is the pendulum; C the barrel with its ratchet-wheel R, great wheel D, and weight P; *d* the pinion of E, the centre-wheel, which drives the pinion *e*; F the contrate-wheel, working in *f*, the pinion of G H the crown or scape-wheel; I K the pallets, which move U X the fork of the pendulum; L M the plates of the potence, screwed on S T the back plate of the frame; N O *p q* shew the dial-work, of which N is the wheel or pinion which moves O the outer wheel, before which is situated *p* the pinion of report, which works in the teeth of *q* the dial-wheel. In some clocks that have no contrate-wheel, the scape-wheel instead of being in the position of G H, is placed before *e*, with the crutch immediately above it.

The references in Fig. 2. will be given in the explanation of the plates.

Fig. 7. represents the parts of a single-cased watch in connection, seen in profile, and supposing them extended along a straight line. A A is the front plate of the frame; *c c* the bush forming the central hole for the passage of the axis of the central-wheel; B B the depression for receiving the dial-plate; C C the back or *pillar*-plate of the frame; D the spring-box, with the chain coiled round it; E the fusee; *d* a hollow round the arbor of the fusee, calculated for receiving oil; G the great wheel of the fusee; *h* the pinion of I the centre-wheel; *k* the pinion of L the third wheel; *l* the pinion of N the contrate-wheel; *m* the pinion of N the balance-wheel; O the potence; *o*, *p*, the verge of the balance; P Q the cock that covers R R the circle of the balance; *r*, *r*, the situation of the regulator; 6, 7, is the axis of the central-wheel prolonged through the dial-plate to *z*, carrying the pinion *u*, which works in the teeth of S, the outer wheel of the dial-work, whose pinion *x* moves the wheel *o v*, fixed on the socket which carries Y the hour-hand; X the minute-hand. This profile is taken from a single-cased watch.

Fig. 8. represents a plan of the relative position of the works of a watch as seen within the frame. A is the front plate, with 1, 2, 3, 4, its pillars; D the spring-box; S the chain; E the fusee; G its great wheel; I the central-wheel; L the third wheel; and M the contrate-wheel.

The striking apparatus of clocks remains to be considered. This part of their construction is not easily described in words, or easily understood without actual inspection, as it is very complex, and varies in different machines according to the taste or fancy of the maker. In general, in a clock, it consists of certain wheels, springs, and levers, so adjusted as, at certain intervals, to throw back a hammer, which, when set at liberty, strikes against a bell as often as the hour requires. In the usual eight-day clocks, the arbor of the centre-wheel carries a wheel behind the hour-hand, the teeth of which work in the teeth of the outer wheel of the dial-work, and the socket which bears the hour-hand also carries with it a metalic plate, the edge of which forms a spiral cut into 12 indentations, which are successively more and more remote from the axis. This plate is generally called the *snail*. Near its edge is placed a pin that supports a metalic arch in the form of a sector, the limb of which is cut into 13 or more equal teeth, and at its centre it has a metalic arm, with a pin within the side opposite the edge of the snail, against which it strikes, and catches on one of the indentations near the conclusion of every hour. The limb of the sector is connected with a lever bearing a claw that shuts in to the teeth of the sector, and the extremity of this lever rests upon another longer lever, which is furnished with a descending arm which hangs before the outer wheel of the dial-work. On the circumference of this wheel is a pin which, as the wheel revolves every hour, comes in contact with the arm, and raises the long lever, which, in its turn, raises the short lever, detaches its claw from the teeth of the sector, and allows the sector to fall so far to one side that the pin of its arm strikes against one of the indentations of the snail corresponding to the hour then pointed out by the hour-hand. All these parts of the striking apparatus are generally situated between the frame and the dial-plate. The rest lie within the frame, and form one side of the clock. They consist of a barrel, with its ratchet-wheel, great wheel, and weight, similar to the corresponding part on the other side; of an axis bearing a pinion that works in the teeth of the great wheel, and a wheel having eight pins set at equal distances along the front of its circumference, whence it is called the pin-wheel, though it is often called the *striking-wheel*; of a third wheel, and its corresponding pinion, the latter of which works in the teeth of the pin-wheel, while the former acts on another pinion, whose axis carries a fourth wheel, with a single pin on its circumference, commonly called the warning-wheel. The axis of the third wheel, projecting through the front plate of the frame, bears on its extremity a short arm, and forms on one side a wedge made to fit into the teeth of the sector. This fourth wheel acts on a pinion, the axis of which is furnished with two metalic vanes, forming what is called the fly. The hammer is placed on one end of an axis, and, by means of a spring, is made to approach very near the bell, while the other end of its axis is furnished with a lever, which, being raised by the pins of the pin-wheel in its revolution, forces back the hammer to enable it to strike the bell with greater force when set at liberty.

In the usual quiescent state of the striking apparatus, the sector remains locked with the claw of the short lever, and with the pin of its lower arm at a distance from the edge of the snail; but as the outer wheel of the dial-work revolves, a pin that is fixed to its circumference gradually comes in contact with the depending arm of the long lever, pushes it aside, and then is produced the noise called the warning of the clock, while, by the motion of the long lever the short lever is raised, and the sector extricated from its claw, falls into its proper position, aided by a weak spring which presses against its lower part; the fly is set in motion, and would immediately cause the clock to strike, were it not for an arm attached to the extremity of the long lever, which passing through a hole in the front plate of the frame presses against the pin in the uppermost wheel, and holds all quiet till the minute hand arrive at the point of 12. At this moment the detent, as the internal arm of the long lever is called, is loosed from its hold on the pin, the fly is set in motion, and its pinion acting on the uppermost wheel, which communicates motion to the rest, the lever on its axis turns quickly round, and

Construction

the wedge forces the sector back tooth by tooth till the strokes of the hammer are completed, when the lever prevents farther motion of the striking apparatus, by its extremity coming in contact with a pin placed at the outer corner of the sector.

Repeating clocks and watches are highly curious and ingenious, but not so useful as is generally supposed. Their mechanism is extremely complex, and is therefore easily deranged, and requires a nice and experienced hand to re-adjust it. The want of such a repeater will be very little felt by a person of even ordinary delicacy of touch, who may easily acquire the faculty of ascertaining the hours and quarters, which is all that a repeater can effect, without the aid of light. To those who have not accustomed themselves to this useful practice, the following hints may not be unacceptable. On raising the glass of an ordinary watch, the relative position of the hour and minute hands may readily be felt on the dial-plate without deranging them. The hour hand is distinguished by its being shorter than the other; and if it be felt exactly at the top, at the bottom, or in the middle of either side, points which are easily ascertained, the required hour is evidently 12, 6, 3, or 9. If it be found within either of the quarters of the dial, as between 12 and 3, it must either be in the middle of that space, or nearer to one of its extremes than the other; in the former case it is half past 1, or in the other quarters half past 4, 7, or 10, which may be proved by feeling the minute hand at or near 6; in the latter case it is that hour which is nearest one extreme of the quadrant, suppose 12, 1, 2, or 3. The quarters may be found with equal facility by feeling the minute hand at or near 3, 6, or 9. This habit of feeling the hour is often carried to such a degree of nicety as to ascertain the time to within a very few minutes of the truth.

The case of clocks and watches serves to protect the works from injury, from dust and moisture, and in watches to render them portable. A clock-case generally consists of a body for admitting the descent of the weights, a support on which the frame of the clock rests, and which is perforated with holes for the passage of the cords, and of the screws by which the frame is kept steady, and a glazed head which slides on and off the body, and is fixed by a button on the body of the case, and a hook on the door of the head. Watch cases are either single or double. They consist of two parts, one of considerable depth for containing the works, or inclosing the body of the watch; and a rim, which is generally open, or contains the glass. In what are called hunting watches, both parts of the case are generally similar and equally stout; and there is either no glass, or a small one, in the middle of the upper part of the case. Single-cased watches have the arbor of the fusee appearing through the dial-plate, and are wound up by turning the arbor to the right; but in double-cased watches, the arbor passes through a hole in the lower part of the inner case, and in winding up the watch is turned to the left. The projecting piece by which the watch is held and suspended, is technically called the *pendant*; and in repeating watches this may be pushed inwards, and sets the striking part in motion.

General principles.

CHAP. II. OF THE GENERAL PRINCIPLES OF CLOCK AND WATCH-WORK.

The uses of some of the parts of clock and watch movements have been occasionally mentioned in the above description; but the manner in which they conspire to the uniform and accurate measurement of time remains to be explained. For this purpose, it is proper to consider, first, the relative number of teeth in the principal wheels and pinions, and the calculations on which their mutual action depends.

The number of teeth in the wheels and pinions in the time-keeping part of a clock, depends on the length of the pendulum, or the time in which it makes its vibrations. In the ordinary eight-day clocks, where the pendulum is 29.2 inches long; and therefore swings seconds, the 'scape-wheel, in which the pallets work, has 30 teeth, turns round once in a minute, and in modern clocks carries the second hand. Now, as the pendulum makes 60 vibrations in the time that the 'scape-wheel goes round once, it is evident that each pallet of the crutch is acted on successively by every tooth of the wheel. Again, it is required that the centre-wheel shall move round once in an hour; and, to effect this, it is necessary that the teeth of the pinions and wheels that form the train or series between the crown-wheel and the great wheel should bear a certain proportion to each other. Suppose the centre-wheel to have 60 teeth, which is a very common number; in order that this wheel shall move round only once while the crown-wheel moves 60 times, one tooth of the former must advance one step in a minute. This will be effected if the pinion of the next or third wheel consists of eight leaves, while that wheel itself has 56 teeth, and the pinion of the crown-wheel seven leaves. These numbers are determined by the following simple rule:—*If the quotient of the number of teeth in the centre wheel, divided by the number of leaves in the pinion of the third wheel, be multiplied by the quotient of the teeth in the third wheel, divided by the leaves in the pinion of the crown-wheel, and that product be multiplied by twice the number of teeth in the crown wheel, the result will be the number of beats or vibrations made by the pendulum in an hour.* Thus, in the present case, $\frac{60}{8}$ is 7.5; which multiplied by 9, the quotient of $\frac{56}{7}$ gives 60, and that multiplied by 30 × 2 or 60 is 3600. The number of teeth in the great wheel is arbitrary,—commonly 96 in an eight-day clock.

In the dial-work, it is required that, while the wheel fixed on the socket of the minute-hand makes 12 revolutions, (one every hour,) the wheel on the socket of the hour-hand shall make one revolution. To effect this purpose, the following numbers are usually employed. The former wheel has 44 or 30 teeth, and the outer wheel of the dial-work which acts with it, and also makes one revolution every hour, must also have the same number; the pinion of this last has 6 leaves, and of course the wheel carrying the hour-hand must have 12 times 6, or 72.

In those clocks which shew the day of the month, the socket of the hour-hand carries, between the wheel of 72 teeth and the snail, a wheel of 32 teeth, which acts on an outer wheel of 64 teeth; so that while the former makes one revolution in 12 hours, the latter makes just half a revolution, or one in 24 hours; and the axis of this last has a hook which, at the end of each revolution, enters a notch in the day-of-the-month circle, and moves it one step or number every day.

The absolute numbers for the teeth and pinions of a watch vary in different watches, but must always bear a certain proportion to each other. It is desirable that these proportions should be such that the watch shall give a certain number of beats in a second; and the following numbers, calculated for that purpose by Mr William Pearson, will be found to answer extremely well for a watch that shall shew hours, minutes, and seconds, and go 30 hours. The fusee is to have 6 turns; its great wheel 50 teeth; the pinion of the centre-wheel 10 leaves, the centre-wheel itself 60 teeth: the pinion of the third wheel 8 leaves, its teeth 64; the pinion of the contrate-wheel 8 leaves, its teeth 48; the pinion of the crown-wheel 6 leaves; this wheel 15 teeth, besides the 2 pallets of the verge. The number of beats made by a watch in an hour and a second are determined by the following rule: *Multiply successively the number of teeth in the centre-wheel by the number of teeth in the third, contrate, and crown wheels, and pallets, and divide this product by the product of the leaves of the third wheel pinion, multiplied successively by the leaves of the pinions of the contrate and the crown wheels, and the quotient will shew the beats in an hour. Divide this quotient by* 3600, *and the new quotient will shew the beats in a second.* Thus, in the present instance, $60 \times 64 \times 48 \times 15 \times 2$ gives 5529600, and $8 \times 8 \times 6$ gives 384; and $\frac{5529600}{384}$ is 14400, and $\frac{14400}{3600}$ is exactly 4.

The numbers for the striking part of clocks are still more various, though their adjustment depends on certain rules. In the clock from which the description of the striking part already given is taken, they stand as follows. The great wheel has 84 teeth; the pinion of the pin-wheel 8 leaves, that wheel itself 56 teeth; the pinion of the third or *detent*-wheel 7 leaves, while that wheel has 56 teeth; the pinion of the warning-wheel 7 leaves, that wheel 47 teeth; and the pinion of the fly 7 leaves. But in calculating the proportions, regard is paid only to the pin-wheel in the detent-wheel, and the *counting*-wheel, or that which carries the hour hand. Now this last wheel usually revolves once in 12 hours and has 72 teeth; the detent-wheel moves once round for every stroke of the clock, and the pin-wheel moves according to the number of strokes and of its pins, in the present case once round at VIII o'clock, or once for 8 times of the detent-wheel, and 78 strokes are made in 12 hours. Thus, it appears that the pin-wheel having 56 teeth, the pinion of the detent-wheel must have 7 leaves, because $\frac{56}{8}$ quotes 7, and so of the rest. The reader will find an explanation and illustration of these subjects in Derham's Artificial Clockmaker, and in the Horological works of Cumming, Mudge, and Berthoud.

The form of the teeth is of great importance, as on that depends the uniformity and facility of the movement. To explain this part of the subject fully, would be to anticipate much of the mathematical principles of MECHANICS, which will more properly be considered in another part of the work. It is sufficient here to remark, that the best form for the teeth of those wheels which act on other wheels or on pinions, is found to be the *epicycloidal*, or that which is derived from the revolution of a particular curve upon or within a given circle,—while the teeth of such wheels as act on pallets must be so formed as alternately to catch the pallet, and gradually allow it to slide off, an action which is aided by the form of the pallet itself.

The equality and equidistance of the teeth is another essential point, especially in scape or crown wheels, for ensuring uniformity of movement. Besides these circumstances, what is called the *pitching* of the wheels and pinions, that is, the proper arrangement of them in the frame, so that their teeth and leaves shall act with sufficient force on each other without too much friction, is particularly attended to. If set too near, there is too much friction; and if too far apart, they do not act with sufficient force.

All these points being stated, the action of the works is easily explained. In common clocks, when the works are wound up and the pendulum set in motion, the weight on the going side acting by its gravity on the barrel, turns it round, and causes the teeth of the great wheel to act on the pinion of the centre-wheel, the axis of which carries round the minute-hand, and the wheel which, through the medium of the pinion of report, turns about the hour-hand. In the mean time, the teeth of the centre acting on the pinion of the third or contrate-wheel, cause the teeth of that wheel to impel the pinion of the scape or crown-wheel, and thus make the teeth of that wheel act on the pallets of the crutch. One of these teeth coming in contact with one of the pallets drives it to one side, so as to make the pendulum move in a small circular arc, till the pallet escapes for an instant from the tooth, when the pendulum falling by its weight, moves along the same arc in a contrary direction, till the other pallet is caught, and escapes in the same manner. Thus by the *sustaining* power of the 'scapement, the vibrations of the pendulum are preserved uniform and equal.

Fig. 4. illustrates the mutual action of the teeth of the scape-wheel and the pallets of the crutch, according to Graham's construction. B A C is the crutch suspended at the centre A, and B D C is a portion of the scape-wheel, of which BC are two teeth. The left side of the pallets of the crutch consists of a plane next the point, and a circular arc next the arm of the crutch, so that the teeth, as the wheel revolves in the direction B D C, strike against the pallets, and slide along them till they escape. By this form of the pallets the pendulum is made to *throw out* well, or proceed beyond the *angle of scapement* at each vibration, and the principal force of impulsion is applied in the quiescent or natural position of the pendulum, both of which circumstances are attended with great advantage.

In a watch just wound up, the *main-spring* within the box exerts its full force, turns round the box, and uncoiling the chain from the fusee, turns it round, and consequently the great wheel in the same direction, that is, towards the left, while the centre-wheel and its pinion, as in clocks, are carried round to the right, bearing the minute-hand along with them; and as the pinion of report with the outer wheel of the dial-work turns to the left, the wheel that carries the hour-hand moves to the right, and thus this hand is also made to follow the minute-hand in that direction. By the teeth of the centre-wheel, the pinion of the third wheel, and consequently that wheel itself, is carried to the left, so that the contrate-wheel, which bears the second hand, moves to the right. The teeth of the contrate-wheel acting on the pinion of the balance-wheel, impel this last wheel in a vertical position towards the back plate of the frame; and as the pallets of the verge are placed contiguous to opposite teeth of the balance-wheel, they are impelled alternately to the one side and the other, and carry with them the balance, as far as the balance-spring allows it to go.

The conical form of the fusee enables the main-spring to exert nearly an equal force on the great wheel during the going of the watch; for the point of attachment of the chain is most distant from the box at the time when the elastic force of the spring is greatest, or, in other words, the resistance to be overcome by the spring is greatest when its power is greatest, and the former gradually lessens as the latter becomes weaker, according to a familiar principle in mechanics, that the greater the diameter of a wheel on which a power acts, the less exertion of the power is necessary to overcome the equilibrium and produce motion. The time during which a watch is capable of going without being wound up, depends chiefly on the number of turns in the spiral groove of the fusee, which in the ordinary watches that go for about 30 hours are about five and a half.

In the construction of time-keepers in general, the following circumstances chiefly are regarded; that the action of the moving power, that is, the weight or main-spring be preserved as equable as possible; that this force be applied to the regulating power, the pendulum or balance, in the most eligible manner, and that the regulating power employed shall as nearly as possible be *isochronous*, or shall perform its vibrations, whether long or short, in *equal times*. How the first two of these circumstances are secured may be understood from the preceding descriptions and remarks, and the best methods of effecting the last will appear from the sequel.

The isochronism of the pendulum or balance depends in a great measure on the construction of the 'scapement by which it is kept in motion, and on the form and adjustment of that regulating power. The impelling power must be applied in the most uniform and direct manner, and with the least loss of motive force; of course, friction must, as much as possible, be avoided; and the pendulum or balance must be adjusted in such a manner that its vibrations may be as free and undisturbed as is consistent with mechanical action.

The ordinary 'scapements already described are what have been termed *recoiling*, because, by the impulse given by the crown-wheel to the pallets, the former is each time driven a little back with a visible recoil, as may be observed by watching the motion of the second hand in a common clock; but the improved clock 'scapement of Graham, producing little or no effect of this kind, is termed a *dead-beat* 'scapement. By this construction the vibrations of the pendulum are rendered more isochronous. On the same principle is formed Graham's improved 'scapement for watches, or what is called the horizontal scapement, which gives to those watches that contain it the name of horizontal watches.

This 'scapement is represented at Fig. 1. Plate 104. where E D shews part of the rim of the balance-wheel, with A C two of its teeth, having their faces *b e* formed into planes inclined to the circumference of the wheel, at an angle of about 15°; so that the length *b e* of the face is nearly four times its height *e m*. Suppose that a circular arch, A B C, described round the centre of the wheel through the middle of the faces of the teeth, the axis of the balance passes through some point B of this arch, and the mean circumference of the teeth may be said to pass through the centre of the verge. On that axis is fixed a portion of a thin hollow cylinder *b c d*, made of hard tempered steel, or of ruby or sapphire, or some other hard tough stone. The cylinder is placed on the verge in such a manner, that when the balance is queiscent, the two edges *b* and *d* are in the circumference which passes through the points of the teeth. By this construction the portion of the cylinder is made to occupy 210° of the circumference, or 30° more than a semicircle. The edge *b*, to which the tooth approaches, is rounded off at both angles, while the other edge is formed into a plane inclined to the radius at about 30 degrees. Suppose then the wheel pressed forward in the direction A C, the point *b* of the tooth touching the rounded edge pushes it outwards, turning round the balance in the direction *b*, *c*, *d*. The heel *e* of the tooth escapes from the edge when in the position h, with *e* in the position *f*. As the point *b* of the tooth is now at *d*, and the edge of the cylinder at *i*, the tooth rests therefore on the inside of the cylinder, while the vibration of the balance is continued by the impulse received from the inclined plane while pushing it aside. When the vibration ceases from the opposition of the balance-spring the balance returns, while the tooth now in the position B rubs on the inside of the cylinder. By the action of the spring the balance is returned with an accelerated motion to its former position *b*, *c*, *d*, and would now vibrate as far on the other side. It is now again pressed on at the edge *d* by the tooth, and pushed aside into the position *k*, when the tooth escapes from the cylinder. The other edge of the cylinder is now in the position *l*, and in the way of the next tooth now in the position A, the balance continuing its vibration, the tooth rubs along the outside of the cylinder. This vibration in the direction *d c b* being finished, the balance by the action of the spring is moved in the direction *b c d*; and the tooth beginning to act on the first edge *b*, as soon as the balance returns to its former position, pushes it aside, escapes, and drops on the inside of the cylinder. In this manner the vibrations are produced, increased gradually to their maximum, and conti

General principles.

nued. Each succeeding tooth of the wheel acts first on the edge *b*, resting on the inside, and then on the edge *d*, resting on the outside of the cylinder. The balance is under the influence of the wheels while the edge *b* passes to *h*, and *d* to *k*; but the rest of the vibration is performed without the influence of the wheels, being a little obstructed by friction and the clamminess of the oil. In this construction, as above described, the arch of action or the 'scapement, being twice the angle which the face of a tooth makes with the circumference, evidently amounts to 30 degrees.

To explain how the cylinder is connected with the verge, so as to make so great a revolution round the teeth of the wheel, it must be observed that the triangular tooth *e*, *b*, *m*, is placed on the top of a little pillar fixed into the extremity of the piece of brass *m*, D, formed on the rim of the wheel. The wedge tooth has thus its plane parallel to the plane of the wheel, but at a little distance above it. At Fig. 2. is represented the verge, a long hollow steel cylinder hardened, with a considerable portion cut out, and at Fig. 3. this cylinder spread flat. Suppose that figure 3. were rolled up till the edges G H and G H are joined, and the cylinder will be formed. The dotted line *b d* represents the part acted on by the point of the tooth. The part D E F E connects the two ends.

Many other 'scapements have been constructed, and are described in the works of Berthoud, Thiout, Robison, and other writers on horology. Among the best in modern use are those of Arnold, Earnshaw, and Lepaute.

Friction.—From the very nature of wheels and pinions, the mechanism of time-keepers is necessarily more or less liable to the inconvenience of *friction.* By a proper form of the teeth and leaves, and a just *pitching*, this inconvenience is lessened, and it is still more counteracted by the occasional application of oil. It is of most consequence to obviate friction in the 'scapement, as this part of the mechanism, being subject to greater motion, wears faster than the rest. This is particularly the case with the holes in which the pivots of the verge play in watches, and it has given occasion to the practice of jewelling. The holes in the cock and in the foot of the potence are filled with small pieces of diamond, in the smooth depressions of which the pivots play. By this improvement, the durability of the 'scapement is increased, though it is alleged that the watch does not keep time better than one whose pivots play in brass holes. It is also said that jewelled holes are apt to fill up sooner than others, not by the wearing away of the pivots from attrition with the stone, but from the oil employed becoming sooner viscid. How that should happen it is not easy to conceive, and probably the fault lies in the nature of the oil used. But this subject will be resumed in the next chapter, in which directions are given for what may be called the domestic management of time-keepers.

CHAP. III. OF THE MANAGEMENT AND USES OF CLOCKS AND WATCHES.

Management & Uses

The uniform and accurate movement of even a well constructed time-keeper, depends on several circumstances, which it is in the power of the possessor to command or regulate, as its ordinary *position*, the *temperature* to which it is exposed, the time of winding up, its condition with respect to *cleanness* or *dryness*, its liability to *agitation*, and its proper *regulation.*

1. *Position.*—The only proper position of a clock is vertical, and in placing the ordinary house clocks some nicety is required in ensuring the perpendicularity of the case. If it incline forward, the weights rub against the door in their descent, and when wound up catch against the bottom of the case, and thus disturb the regular coiling of the cord. If, again, the case incline backward, the weights are apt to interfere with the pendulum, and the pendulum itself to rub against the case, while an inclination to either side renders the motion of the pendulum unequal. It is usual to fix a clock-case to the wall by one piece of wood, but it would be more secure as well as more perpendicular by using two pieces, and care should be taken that the floor on which it rests is smooth and even.

Pocket-watches are necessarily exposed to continual changes of position, but fortunately, from their construction, they are less liable to injury than clocks from these changes; but in them too the most desirable position is vertical. When removed from the pocket, they are generally suspended by the chain, and the only objection to this situation is, that they are then generally placed in a lower temperature. It is therefore better to lay them below the bolster; and when in a horizontal position, most watchmakers advise they should be laid on the glass rather than the back.

2. *Temperature.*—Much depends on the equability of the temperature in which time-keepers are kept. Too much heat makes them go slow, by expanding the pendulum or spring, and too much cold has the contrary effect, while it is apt to congeal the oil used for diminishing friction. Provided the temperature be not so low as to produce this last inconvenience, the absolute degree is of little importance; but whether the situation be warm or cool, it is necessary that the temperature be as uniform as possible, since the absolute effect of the heat or cold can be variously counteracted.

In watches, the effect of increased or diminished temperature is different according to the size of the balance. When the balance is small and light, cold tends to make the watch go slow; and a cold equal to freezing has been observed to make such a watch lose 15 minutes in a day, while in watches with a large balance, making long vibrations, the effect of frost has been so contrary, that the watch would gain seven minutes in 24 hours.

Various contrivances have been practised to *compensate* for the effects of altered temperature. Among the most convenient are the gridiron pendulum for clocks, and the compensation-balance for watches.

The gridiron pendulum, represented at Fig. 6. of Plate 108. has a compound rod, formed of nine wires, five of which are steel and four brass, so arranged, with cross bars, that when the bob might be lowered by the expansion of the steel wires, or raised by their contraction, these effects are counteracted by the expansion or contraction of the brass wires, which tends to move the bob in the contrary direction.—Sometimes only seven or five wires form the compound rod.

Arnold's compensation-balance is represented in plan or Fig. 4. of Plate 104, where *a b a b* are two curved bars or wires formed of steel coated with brass, bent into an arch that is concentrate with the rim of the balance, and fastened at the extremity *a* to pieces *d e* that are screwed on the rim of the balance, while the other extremity *b* is free, and is loaded with a weight C. Now, as the balance, and these its appendages, are expanded by heat or contracted by cold, the weight C would tend to recede from or approach towards the fixed point, and thus derange the proper action of the balance; but these effects are prevented by the nature of the compound arch, which always keeps the weights at their proper distance by the different contraction of the two metals of which it is composed.

3. *Winding up.*—In order that a time-keeper shall go uniformly, it is necessary that it should be wound up at regular stated periods. A clock or watch is so constructed that it shall go without winding up during a certain interval,—an ordinary clock for eight days, and an ordinary pocket watch for 30 hours; but as towards the end of these periods the motion becomes either slower or otherwise unequal, it is proper to wind them up some hours before they stop; the usual plan of winding up a clock once a-week, and a watch once in 24 hours, is therefore good, but it should always be done at the same hour. For watches, the old fashioned winch-key is preferable to the new straight one, as the winding up is performed by the former more steadily and expeditiously.

4. *Cleanness.*—It is obvious, that unless the works of these machines be kept free from dust and moisture they cannot keep time accurately or uniformly; and hence appears the necessity of having the cases close and tight, and of occasionally taking them to pieces and cleaning them. A well made watch kept with care generally requires cleaning once in three years, but a house-clock, being necessarily more exposed, sooner accumulates dust, and requires more frequent cleaning. To obviate this inconvenience as much as possible, the case should be regularly but cautiously dusted at least once a week, and the head taken off, so that the works may be strongly blown on with a pair of bellows.

It has been shewn that the works of time-keepers require the occasional application of a little oil to obviate friction. The best oil for this purpose is the purest and freshest olive, or what is generally called *Florence oil.* A little of it, taken up on the end of a pointed instrument, is inserted at the juncture of the wheels with the pinions, at the holes in which the principal pivots play, and more especially round the arbor of the fusee.

5. *Agitation.*—It is found that clocks which are so situated as to be exposed to frequent agitations from the rattling of wheels on the pavement, the slapping of doors, or similar causes, keep time very irregularly. In the case of public clocks in towers or steeples, this inconvenience cannot be avoided; but with house clocks it may in a great measure be prevented by placing them at a considerable distance from the street door, on a firm and solid basis, such as the landing place of a stone stair-case, or in the corner of a paved kitchen.

It has been remarked that when two clocks stand very near together, they are apt to be affected by a sort of sympathy; that sometimes, though under different regulations they keep time exactly alike; and that occasionally one of them disturbs or entirely stops the motion of the other. These circumstances have not been satisfactorily explained.

6. *Regulation.*—The proper regulation of clocks and watches is a matter of great importance, and may, in general, be easily managed without applying to the watchmaker. Ordinary clocks are regulated by means of a nut that screws upon the lower extremity of the pendulum rod; for by screwing it farther on, the ball of the pendulum is raised, and the vibrations are thus performed in shorter intervals, so that the clock goes faster than before; but to make the clock go slower, the screw is turned in the contrary direction, so as to lower the ball, increase the effective length of the pendulum, and render its vibrations slower. Watches are regulated by turning the regulator to one side or other, according as the watch goes too slow or too fast; but, as in different watches the effect of this motion varies, it is necessary to be more explicit. In general, the letters F and S, for fast and slow, are engraved on each side of the regulator in English watches, or A and R (for *Avancer* and *Retarder*) in foreign watches; but sometimes only the figure of a hand, with the forefinger stretched out, is seen on that part towards which the regulator is to be turned to quicken the motion of the watch. Therefore, if the watch be going too slow, the regulator must be turned a degree or more towards F, A or the hand; if it go too fast, it must be turned in the contrary direction.

It is often convenient, to regulate time-keepers when the inequalities of their going are very small, or when a good regulating clock or watch is not at hand to compare them with, by attending to the motions of the stars. This is done in the following manner.

Astronomical observations shew that the stars make 366 revolutions in about a minute more than 365 days; so that this motion, from one point of the compass to the same point, is performed in $\frac{1}{365}$ part of mean solar time less than 24 hours, that is, in about 23 hours, 56 minutes, and 4 seconds of time, as measured by a clock or watch. Therefore, comparing a well going clock or watch with the revolution of any particular star, it will be found that such star arrives at a certain point about 3 minutes and 56 seconds sooner every night than any particular hour pointed out by the time-keeper. Now, suppose a person on any one night, through a hole in a plate of metal fixed in a window shutter, observes a particular star disappear behind a certain object, as a chimney or the gable of an opposite house, at 10 o'clock on the first night of observation, and that each successive night it disappears 3 minutes and 56 seconds sooner, as counted by the clock or watch, for about 14 nights, it is pretty evident that such clock or watch keeps good time. If the star seems to disappear regularly in a shorter interval, it goes too fast, and if the interval appear longer it goes too slow, and must be regulated accordingly by the methods already pointed out. The annexed table will enable an observer to manage this process very correctly, as it shews the difference of time when a star should disappear for any number of days. Thus, on the first night of observation, the difference between the star and the time-keeper is 3 minutes 56 seconds, and on the fourteenth day it is 55 minutes 4 seconds, that is, 4 minutes and 56 seconds after nine. Should this agree with the clock or watch, it requires no regulation; but if the time pointed out by the time-keeper should be a few seconds or minutes less or more, the time-keeper goes too fast or two slow. It is evident that this method can be successful only during a succession of clear nights, so that the clear frost of winter or spring should be chosen for the purpose.

Table.

Days.	Hours.	Min.	Sec.
1		3	56
2		7	52
3		11	48
4		15	44
5		19	40
6		23	36
7		27	32
8		31	28
9		35	24
10		39	20
11		43	16
12		47	12
13		51	8
14		55	4
15		59	
16	1	2	56
17	1	6	52
18	1	10	48
19	1	14	44
20	1	18	40
21	1	22	36
22	1	26	32
23	1	30	28
24	1	34	24
25	1	38	20
26	1	42	16
27	1	46	12
28	1	50	8
29	1	54	4
30	1	58	

Uses of time-keepers.—Besides merely measuring time for the ordinary purposes of life, clocks and watches serve many valuable purposes in astronomy, mechanical philosophy in general, navigation, and geography. By their means astronomers are enabled to observe the exact period at which certain phenomena among the heavenly bodies take place, as the appearance and duration of *eclipses* and transits, or the passage of comets, and thus to determine the distances and diameters of those bodies, and calculate the periods of their revolution and returns. By the same means philosophers may determine the velocity of sound, the nature and time of the descent of falling bodies, the relative distance of places, the distance of a thunder cloud, and several other mechanical and natural phenomena. With the aid of a good time-keeper navigators can with greater certainty fix the longitude at which their vessel may be at any given time, or determine the meridian on which she is sailing, and regulate their course accordingly; and geographers can find the true longitudes of newly discovered points of the globe, or of such places as are little known, and thus rectify the errors or supply the defects of maps and charts. Fig. 7. of Plate 104. represents one of the most improved marine time-keepers, suspended in such a manner as to be little affected by the motion of the ship.

Those who are intimately acquainted with the sciences to which allusion is here made, will readily perceive how these objects are to be obtained. Instead, therefore, of giving any illustration of them here, it will be sufficient to explain how the same purposes may be answered by a common pocket watch, which, though seldom an accurate time-keeper, is always at hand, and may, by attention to the following remarks, form a useful and convenient aid in determining the period and duration of several important phenomena.

Two objections naturally present themselves to the proposal of employing a common watch for phiosophical purposes: that it seldom keeps time uniformly, and that the number of beats in a second, by which alone it is proposed to compute in these observations, varies in different watches, and is scarcely ever a whole number. To the first objection it is sufficient to reply, that the portions of time proposed to be measured in this way are so small that, with a watch of any tolerable goodness, the error of time during any one observation must be so minute as to be of little or no consequence; and the other may be obviated by calculating the number of beats per second made by the watch used, according to the rule given in p. 295. For this it is necessary to know the number of teeth in the centre, third, contrate, and crown wheels only, and how many leaves are in the pinions of the last three wheels; and this information may be obtained from the watchmaker who cleans the watch, and marked for occasional reference on the watch-paper.

The number of beats per second being thus ascertained, the watch is to be hung or held near the ear, according as the observer is required to use his hands or merely his eyes; and the beats that take place during the observation are counted, and afterwards are easily reduced to seconds. As the beats are very quick, it is difficult to count every one separately, and it is better to count alternately 1, 3, 5, and so on.

The *alarm-clock*, represented at Fig. 8. Pl. 104. is an ingenious contrivance for rousing a person who wishes to awaken at a certain hour; and it is also of use as a common clock for pointing out the hours, minutes, and seconds.

The ordinary going part is made like that of a common wooden clock, the arbor of the centre-wheel H, carrying a ratchet wheel and pulley, the groove

Historical notices.

of the latter being set with pins for securing a cord that carries at opposite ends the moving weight F, and the counter-poise G, for pulling up the former. The contrate-wheel K carries the seconds hand, and L the crown or scape-wheel impels the pallets of a horizontal verge, on whose extremity is fixed the balance M. The alarm part consists of a crown-wheel P, on whose axis is the pulley Q, bearing the weight R and the counterpoise S. The teeth of P form a 'scapement with the pallets *n*, *o*, on the vertical axis T V, having a cylindrical arm *p p*, *q q*, which is the hammer of alarm, striking alternately a bell when this part of the mechanism is set in motion. The alarm part is so connected with the going part by means of the detent *p*, *q*, *r*, and the plate *t*, which moves on the arbor of the hour-hand, that when the plate is set to any hour at which the person wishes to awaken, and the hour-hand reaches that point, the detent is raised, a pin, which usually locks the arm T V and the hammer, is detached, the alarm sounds, and continues to do so till the alarm part is run down. It is wound up by drawing the weight S till the pin in the wheel P locks the axis T V; and by again arranging the apparatus it is prepared for another alarm.

CHAP. IV. HISTORICAL NOTICES.

Although the time-keepers in present use are confessedly a modern invention, contrivances for measuring time are of very ancient date. Besides sundials, which were employed for that purpose many ages before the Christian era, an apparatus for marking the lapse of time by the dropping of water, something on the principle of the common hour-glass, was very common among the ancient Greeks and Romans. This machine was denominated a *clepsydra* or water-clock, and appears, above a hundred years before Christ, to have been furnished with wheel-work, probably for regulating the motion of an index according to the diminishing of the water. In these machines, the water acted in two capacities, as a *regulating power*, by the regular and nearly uniform falling of the drops, and as a moving force, by the effect it had on the wheel-work.

The famous clock presented by the caliph Harounal-Raschid to the emperor Charlemagne in 807, which marked the twelve hours by the falling of little balls on a sounding body, and had twelve windows, through which as many horsemen appeared and disappeared at the conclusion of every hour, is thought to have been a modification of the clepsydra.

In 850, Pacificus, archdeacon of Verona, constructed a time-keeper, which some suppose to have had a balance as the regulating power; and soon after father Geobert of Magdeburgh, who became pope under the name of Sylvester II., made one more perfect, and more resembling our modern clocks. But it is generally agreed, that clocks with weights, a balance, and a scapement, were not constructed before the fourteenth century, and that the chief merit of the invention is due to the Germans. Early in that century, indeed, Richard Wallingford, abbot of St. Alban's in England, had constructed a clock the motions of which were regulated by a fly like a common jack, but it appears to have had no proper 'scapement.

Historical notices.

At first clocks were erected only in the steeples of monasteries and the turrets of public buildings; and the earliest of these public clocks is said to be that erected at Padua, by order of Hubert, prince of Carrara. In 1356, a public clock was fixed up at Bologna; and towards the end of the 14th century they became pretty general in the large towns in Italy and Germany. The first French clock of any importance was made about the year 1364, by Henry de Vick, a German artist, for the palace of Charles the Wise, who had invited De Vick to Paris, as at that time no French artist was found capable of constructing such a machine.

This clock of De Vick's had a striking apparatus; but striking clocks, from their great expence, were very uncommon, even in the principal cities of Europe, till the 15th century; and the most remarkable of them were those of Nuremburg, Venice, and one belonging to Cosmo I. head of the house of Medici. Towards the end of that century clocks began to be introduced into the private houses of opulent persons.

The application of a balance to clock-work, insensibly led to the invention of pocket watches; but it is difficult to trace this invention to its origin. Some authors have attempted to fix the 14th century as its era; and a ridiculous story circulated in the latter end of the last century, about a watch belonging to king Robert Bruce, which was said to have been found at Bruce castle, for some time gave a colour to that hypothesis. But it seems pretty certain that pocket watches were not known previous to the 16th century. That watches were made at Paris in the middle of the 16th century, is evident from the royal statutes respecting clock and watch-makers issued at that time; but these portable time-keepers must have been very imperfect, before the discoveries of Hooke and Huygens, in the 17th century, led to that perfection which they have gradually attained.

The observations and experiments on the pendulum, and the improved application of it to astronomical purposes by Gassendi, Galileo, and other philosophers of the 15th and 16th centuries, suggested to Huygens, in the beginning of the latter, that this instrument might be advantageously employed to regulate the motion of clocks. It is probable that the same idea had occurred to the mechanical physician Sanctorius; but Huygens has the merit of having first carried it successfully into effect.

Huygens' clock.—A profile of the pendulum clock is represented at Fig. 9. of Plate 104. In most respects it is so similar to Fig. 1. of Plate 103. already described, that the same references and description may serve for both. The clock at present alluded to differs from the former chiefly in having a pulley C fixed on the axis of the great wheel instead of a barrel; and it appears to have been wound up in the same manner with the common wooden clocks, or the alarm clock described at page 299.

During the 17th century, several important improvements were made in the construction both of clocks and watches. In the former, instead of the horizontal verge with pallets employed by Huygens, the common 'scapement now in use, called the Auchar 'scapement, was introduced by Clement of London in 1680; and the modern mode of suspending the pen-

Historical notices.

dulum by a thin flexible plate of steel, instead of hanging it on a thread, the method adopted by Huygens, was contrived about the same time. The improvement of regulating the motions of the balance in watches by means of the spiral spring, was undoubtedly first suggested, if not practically applied, by Dr Hooke of the Royal Society of London, though it has often been attributed by continental writers to Huygens. The latter is said to have made this application in 1675; but, about 17 years before, Dr Hooke had observed the power of springs in restoring the action of a balance, and had employed this construction in a watch of his own, though it was some years before the improvement was generally adopted in England. In the same century, repeating clocks and watches were invented.

In the beginning of the 18th century, Graham, an eminent English watchmaker, contrived and executed his dead-beat 'scapement, and first attempted a compensation-balance. He was followed in England by Harrison, Mudge, Cuming, Arnold; and in France by Lepaute, Sully, Le Roy, and Berthoud, all eminent mechanicians. Sully is supposed to have been the first to conceive the proper construction of a marine time-keeper for finding the longitude at sea, a problem for the successful solution of which high premiums had been offered by several maritime powers, and among the rest by Britain. But he died before he could fully execute his plan. Harrison was more fortunate, and succeeded so well, that he obtained from the British parliament L.10,000, one-half of the premium offered, as the reward of his ingenuity. Arnold in England, and Le Roy in France, made still farther improvements in the construction of marine time-keepers; but the artist who, according to his own account, has carried this delicate mechanism to the greatest perfection, is Ferdinand Berthoud, whose labours in this department of mechanics entitle him to the respect and gratitude of posterity.

The construction of clocks and watches has been materially improved by the invention of engines for dividing and cutting the teeth of wheels and pinions. This useful contrivance originated with Dr Hooke in the latter part of the 17th century, but was very imperfect till the ingenuity and mechanical skill of Ramsden and Troughton, have rendered it as perfect as can well be desired. Formerly, a clock or watch-maker was obliged to form by hand every part of his works, but at present his principal labour consists in finishing off the nicer parts, and properly adjusting the machinery. In no art has the division of labour been of more advantage than in Horology.

Explanation of Plates.

Plate 103. Fig. 1. A side-view of the time-keeping works of an ordinary clock, as described at p. 292.

Fig. 2. Front view of the principal works in a spring or table-clock. From A to 5, 5, on the right hand, the time-keeping part is represented, and from G to R on the left the striking part. A, G, the spring box; B and F the fusees and ratchet-wheels; C and H the great wheels; D, the centre wheel; E, the contrate-wheel; *d* the pinion of 1, the balance-wheel; 5, 5, the verge and pallets; 2, the fork; x y, the pendulum; I, the pin-wheel; K, the detent-wheel; *k*, the fly-wheel; Q, the fly; C, the hammer with its moving apparatus at O; R R, the bell.

Plates.

Fig. 3. illustrates the construction of the ratchet-wheel described at p. 291.

Fig. 4. illustrates the action of the scape-wheel and crutch.

Fig. 5. represents an improved clock 'scapement, after the construction of Cumming. A, a tooth of the scape-wheel resting on the pallet B, from which it is disengaged by the impelling force at C, when a pin in the pendulum strikes against an arm; G and H are two weights that assist in keeping up the motion of the pendulum.

Fig. 6. The gridiron pendulum described at p. 297.

Fig. 8, 9, and 10, illustrate the description of the works and scapement of a pocket-watch given at p. 292.

Plate 104. Fig. 1, 2, and 3, illustrate the construction of Graham's horizontal watch 'scapement, described at p. 296, 297.

Fig. 4. exhibits a plan view of Arnold's compensation balance described at p. 298.

Fig. 5. is a front view of the improved compensation-pendulum, by Mr Bryson of Edinburgh. The rod B b is interrupted at *a b*, and across that space extend two bars, C D *c d*, composed each of a plate of steel and a plate of brass soldered together, and connected at their extremities by two moveable pieces C *c*, D *d*, capable of being adjusted at different distances from the centre, and then fixed by nuts. Between the compound bars are two steel springs *e*, screwed to the parts of the pendulum rod, and supporting nearly the whole weight of the ball A. The compound bars in their natural state are straight and parallel, and being relieved from the burden of the ball are at liberty to expand or contract by the application of heat or cold. In either case, they are bent into a curve by the superior expansion or contraction of the brass over that of the steel, and the curvature is greater according to the length of the bars between the connecting pieces. Hence, when the rod of the pendulum expands and would lower the ball, the compound bars expanding, so as to form two curves with their convexities towards each other, tend to elevate the ball, and thus compensate the effect. On the contrary, when, by the contraction of the rod, the ball is raised, the compound bars contracting form two curves with their concavities towards each other, so as to separate the points *a*, *b*, in proportion to the tendency they have to approach in consequence of the contraction of the rod. The amount of compensation is measured by an index F, placed in the middle of a plate fixed on the pendulum rod, and so connected with the transverse bars below that it indicates the contraction or expansion, on a graduated arch above.

Fig. 6. exhibits a view of the striking apparatus of a repeating-watch.

Fig. 7. represents a convenient method of suspending a marine time-keeper at sea.

Fig. 8. A profile of an alarm-clock as described at p. 299, 300.

Fig. 9. A profile of Huygens' pendulum-clock. See p. 300.

HORROX, Jeremiah, an eminent English astronomer, was a native of Lancashire, and was born about the year 1619; spent some time in pursuing his academical studies at Cambridge, and very early directed his attention to astronomy. In this pursuit he was encouraged by his acquaintance and intercourse with Mr Crabtree, a kindred genius near Manchester; and although their correspondence was only by letters, they carried on a friendly communication on the subject of their studies. Having first read the writings of Lansberg, his sound judgment and accurate observations led him to adopt the more rational opinions of Tycho Brahe and Kepler on the planetary system. But his death in 1641, at the early age of 22, deprived the world of the fine discoveries which were expected from the genius and industry of the young astronomer. A posthumous volume of his works was published by Dr Wallis in 1673. He was the first that predicted or saw the passage of Venus over the sun's disc; and in his new theory of the lunar motions, he coincides with the doctrine of Newton, who speaks of Mr Horrox as a genius of the first rank.

HORSE. For its natural history, see Mammalia; for the method of training and managing horses, see Manege; and for the diseases of the horse, see Medicine, Veterinary.

HORSLEY, John, a learned English antiquary, was a native of Northumberland, and, having studied at a university in Scotland, became pastor of a congregation of dissenters at Morpeth. He died in 1731, in the 46th year of his age. In letters which appeared in 1729, on the antiquities of his country, he discovered his profound knowledge of that subject; but his *Britannia Romana*, a posthumous publication, did not appear till 1732. In this work the connexion of the Romans with Britain is traced, their transactions detailed, and a list of their legionary and auxiliary forces, with their stations, and a description of the Roman walls, is given; a collection of inscriptions and sculptures is contained in a second book; and the third is devoted to the geography of the island.

HORSLEY, Samuel, an eminent mathematician and learned English divine, was the son of a clergyman in London, and was born in 1732; was educated at Westminster school and Cambridge, and early distinguished himself by his progress in mathematical studies. Leaving the university, he took up his residence in London, became secretary to the Royal society, was appointed chaplain to bishop Lowth, and was promoted to several valuable livings in the church. Elevated to the bishopric of St David's in 1788, he was afterwards translated to the see of Rochester, and finally in 1802 to the see of St Asaph. He died in 1806.

As a scholar and a divine, bishop Horsley stands in the foremost rank of the age in which he lived. He was the author of a dissertation on the Latin and Greek Prosodies; he published a new translation of the Prophet Hosea, and a Critical Disquisition on the Eighteenth Chapter of Isaiah, and left in MS. Treatises on the Pentateuch, on the historical books of the Old Testament and of the Prophets; and for several years he maintained a keen controversy with Dr Priestly. His Sermons in three volumes, Charges, Speeches in Parliament, and a Translation of the Book of Psalms with notes, have been published since his death.

As a mathematician, Dr Horsley has also acquired a distinguished reputation. He published, in 1769, an edition of Apollonius, in which he shewed that he was well acquainted with ancient geometry; in 1779, he appeared as the editor of the works of Sir Isaac Newton, in five volumes 4to, to which he added valuable commentaries and separate dissertations; and, in 1801 and 1803, he produced an Elementary Treatise on the fundamental principles of Practical Mathematics, in three volumes.

HORTICULTURE, signifying the management of a garden, is therefore synonymous with gardening. See Gardening.

HORTUS SICCUS, a collection of specimens of dried plants, for the preparation of which see Botany.

HOSPITAL, William Francis Antony De L' Marquis, an eminent French mathematician, was born in 1661; discovered, at a very early period, a strong bias for mathematical learning; and when he was only in his 15th year solved a very difficult problem. He was for some time an officer in the French army; and in his 32d year he distinguished himself by the solution of problems dependent on the profoundest geometry, which had been proposed by John Bernouilli. He was the first Frenchman that wrote on the subject of Newton's Analysis; and his work entitled "L'Analyse des Infinimens Petits," appeared in 1696; and was also the author of "Les Sections Coniques, les Lieux Geometriques, La Constructions des Equations, et Une Theorie des Courbes Mechaniques." He died in 1704.

HOT-BED and **HOT-HOUSE** are contrivances for promoting the growth of exotic plants. For an account of their management see Gardening.

HOTTENTOTS, the original inhabitants of the territories around the Cape of Good Hope, and are supposed by some to be the descendants of a Chinese or Tartar colony. They are different in their features and appearance from the negro Hottentots. During the period that this part of Africa was subject to the Dutch, this miserable people was considered as a degraded race, and kept in a state of barbarous servitude by their unfeeling masters. Under the milder authority of the British government they have experienced better treatment; but, from scanty food and other privations, their numbers are rapidly diminishing. The whole Hottentot population within the colony of the Cape of Good Hope is supposed not to exceed 15,000. The dress of the Hottentots, consisting chiefly of the skins of animals, is extremely simple; their food consists of the roots of plants, of insects, and of a kind of bread made from the pith of the palm tree; their huts, which are of a circular form, are covered with straw, reeds, or rushes, and their weapons are spears, bows, and arrows, and the musket, in the use of all which they are very expert. The reader who wishes a full account of the Hottentots may consult Sparman's *Voyage to the Cape of Good Hope*, Barrow's *Travels to the interior of Southern Africa*, or Campbell's *Travels in Africa*.

Fig. 1.

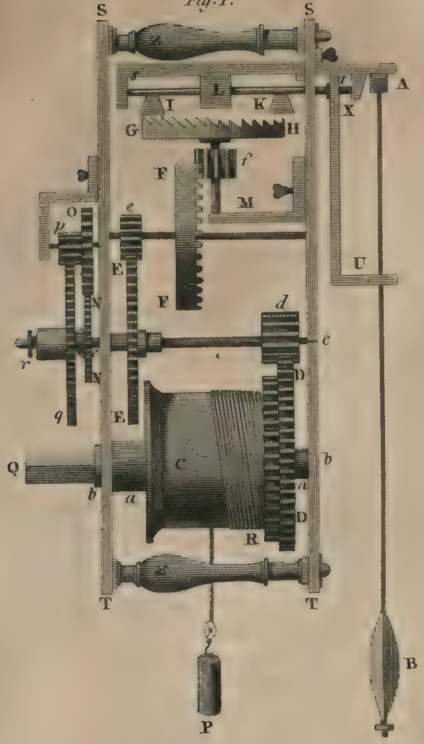


Fig. 2.

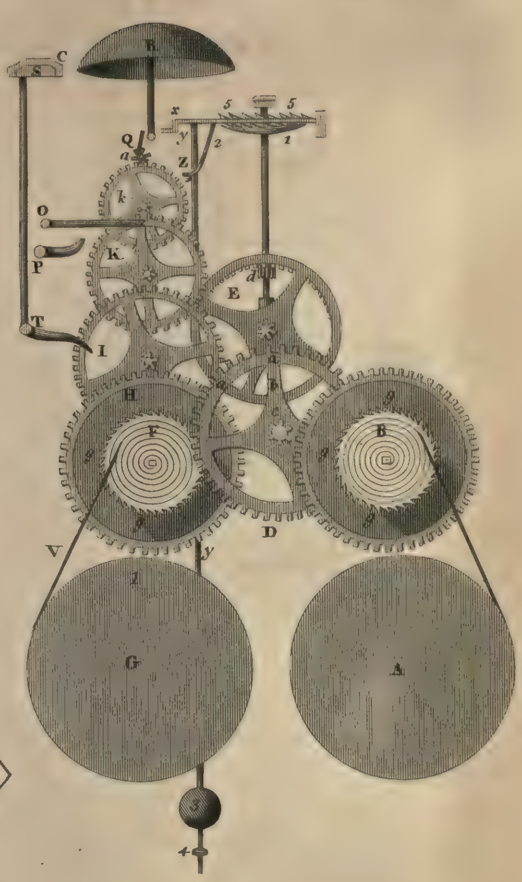


Fig. 3.

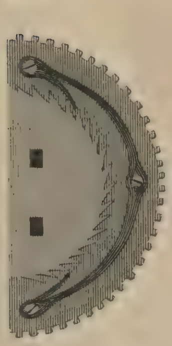


Fig. 4.

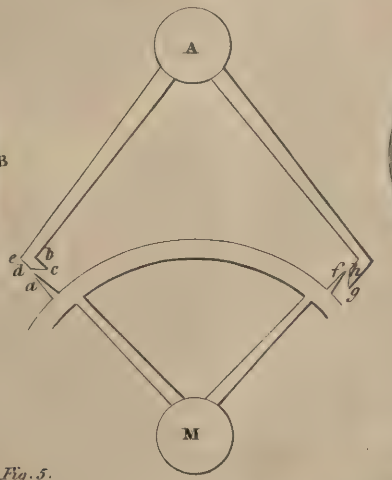
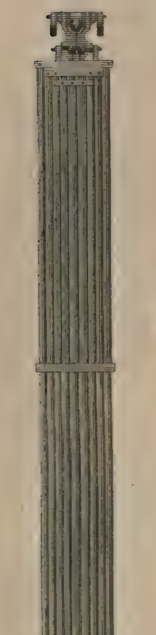


Fig. 6.



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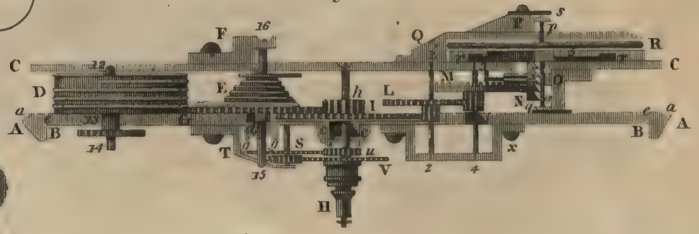

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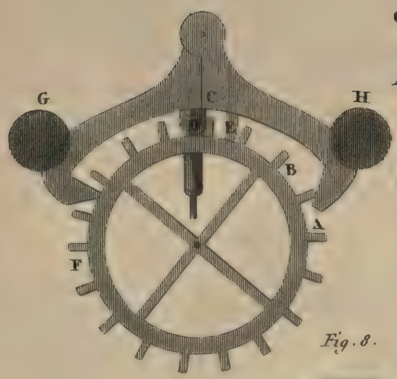

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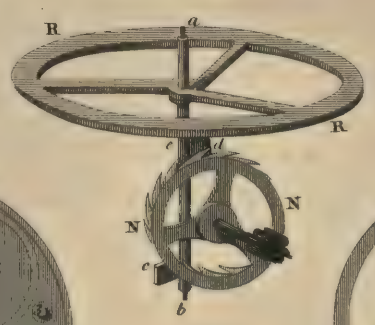

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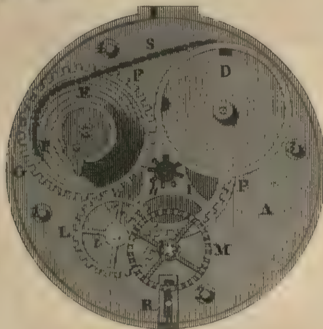

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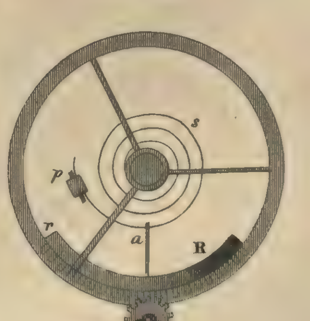

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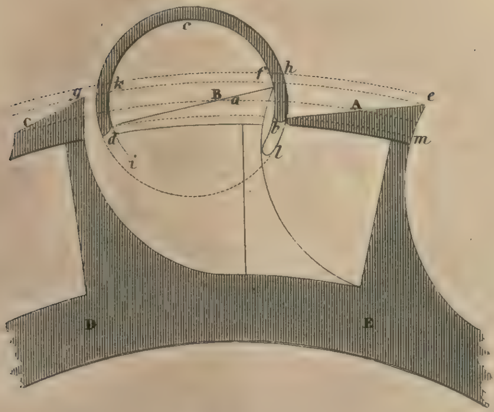
HOROLOGY

PLATE 104.

Fig. 1.



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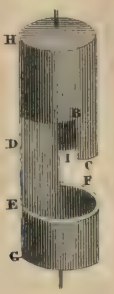

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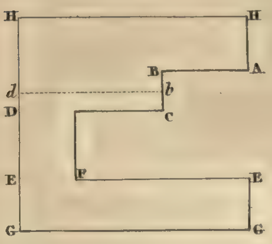

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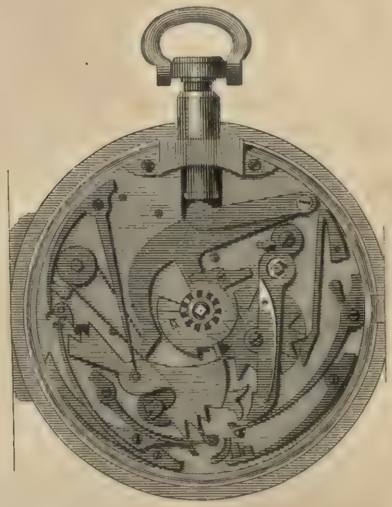

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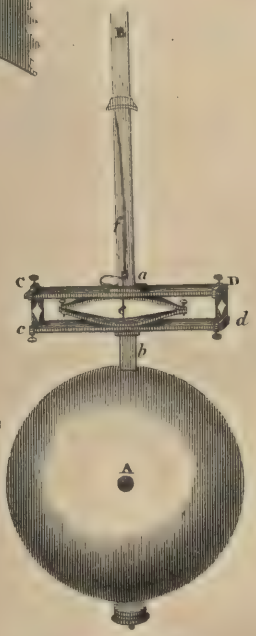

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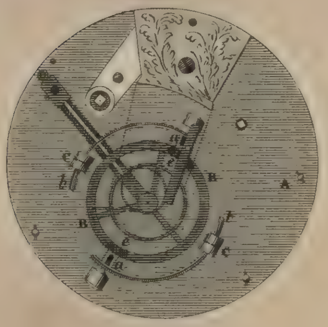

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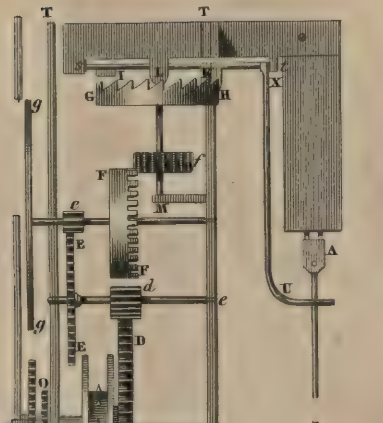

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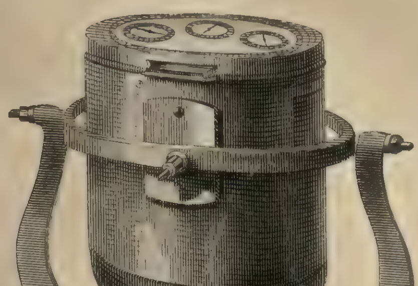

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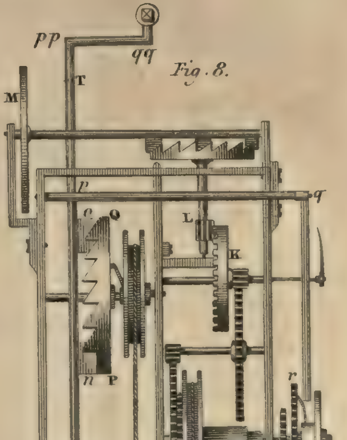

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HOTTONIA, WATER-VIOLET, a genus of plants belonging to the Pentandria class.

HOUND includes several varieties of the common dog which are employed in hunting. See MAMMALIA, and SPORTS and PASTIMES.

HOUR, a measure or portion of time equal to the 24th part of the natural day, and corresponding to the 24th part of the diurnal revolution of the earth, or nearly to fifteen degrees of the equator The Romans divided the day properly so called into 12 hours, and included under it four subdivisions. The first commencing at six o'clock in the morning and called the first hour, the second at nine called the third hour, the third at twelve denominated the sixth hour, and the fourth at three o'clock, distinguished as the ninth hour. The night was also divided into portions of three hours each, or four watches. These divisions of time are alluded to in the New Testament.

In ancient mythology the hours are represented as the daughters of Jupiter and Themis. Homer assigns to them the office of door-keepers of heaven, and Ovid describes them as being employed in harnessing the horses of the sun, and speaks of them as standing at equal distances around the throne of that luminary.

HOUSSA, the capital of a kingdom of the same name in Africa, is situated about two days journey south from the river Niger, and is said to be 200 miles south-east from Tombuctoo. As no European traveller has yet visited Houssa, the information concerning it is little to be depended on. Mr Park was assured that it is larger and more populous than Tombuctoo, which latter place, according to the narrative of Adams the American sailor, covers a space equal to that of Lisbon; but the houses are scattered with little regularity.

HOUSTONIA, a genus of plants belonging to the Tetrandria class.

HOWARD, JOHN, the celebrated philanthropist, was the son of a tradesman of London, and was born in 1727. His education seems to have been extremely limited, either from a feeble constitution or from inattention of those to whom it was intrusted. His father bequeathed to him a handsome fortune; but by his will directed that the son should not be considered of age till he reached his 25th year. Young Howard was for some time an apprentice to a wholesale grocer in London; but disliking the employment, was relieved from his engagement on the payment of a sum of money. He spent some time in travelling in France and Italy; and on his return to England, the state of his health required him to take lodgings at Stoke Newington, in the house of a widow lady, whom he married out of gratitude, it is said, for her care and attention, although she was nearly double his own age.

Soon after the death of his wife, Mr Howard embarked in 1756 for Lisbon, for the purpose of making the tour of Portugal; but the vessel being taken by a French privateer, he was subjected to some of those miseries which it was the business of his future life to redress. For the space of forty hours he scarcely tasted a morsel of food, and was not allowed a single drop of water. "Perhaps," says he in his work *On Prisons*, "what I suffered on this occasion increased my sympathy with the unhappy people whose case is the subject of this book." On his return to England, the condition and treatment of the prisoners were represented to government; and a remonstrance being made to the French court, the prisoners of war experienced more kindness and humanity. Returning from another tour in Italy, Mr Howard married a second time; but in a few years his happiness was again interrupted by the death of his wife, who left him an only child—a son, whose education he superintended for some time. But this son, to the grief of an anxious parent, was doomed to a state of insanity; and although, it is said, the dawn of intelligence afterwards appeared, yet the information of this happy change reached the father only a few days before his death in a distant region.

In performing the duties of high sheriff of the county of Bedford, where Mr Howard resided for some years, he was led to inspect the state of the prisons and other places of confinement under his jurisdiction; and having extended his investigation to similar establishments throughout the kingdom, he communicated the information he had collected to the House of Commons, by whom legislative enactments were passed for the health and comfort of prisoners. To enable him to bring forward more efficient measures for the relief and improvement of the unfortunate beings who had now become the objects of his care and humanity, he made an extensive tour on the continent, visited almost every part of the United Kingdom, and in 1777 published the results of his observations. From the year 1778 to 1783, he was occupied in travelling in Germany, Switzerland, Italy, and Holland, the northern countries of Europe, in Spain, Portugal, France, and Flanders, and with occasional journies in England, Wales, Scotland, and Ireland; and the information thus obtained was laid before the public in the form of appendix to his work.

Another object of deep importance to mankind now engaged the beneficent exertions of Mr Howard, and carried him into a wider and more dangerous sphere of inquiry. For the purpose of discovering the means of preventing the spread of contagion, he determined to examine those countries most subject to the ravages of the plague. With this view he visited many of the towns on the shores of the Mediterranean, touched at some of the islands, remained a short time at Constantinople and Smyrna, and sailed from the latter place to Venice in a vessel which, on its arrival, was required to perform quarantine; and thus had an opportunity of witnessing the usual means of counteracting pestilential infection. Returning home by Vienna, he had an interview with the emperor Joseph II. and he reached England in the beginning of 1787; and in the course of that and the succeeding year having again examined the places of confinement of the United Kingdom, he published the observations which he had collected in his journies, an account of the Lazarettos in Europe, and various papers relative to the plague.

The work now alluded to had no sooner passed through the press, than he prepared for a more extensive tour than any he had yet undertaken. Actuated by the same benevolent spirit, he resolved to visit Russia, Turkey, Asia Minor, Egypt, and the Barbary coast; and passing through Holland and Germany, he arrived at Petersburgh, made a short stay at Moscow, and advanced to the shores of the Black Sea. During his residence at Cherson he caught a fever, in consequence of a visit to a young lady whom he was requested to see; and, after a few days illness, closed his career of active benevolence in January 1790. At his own request his remains were committed to the earth in a spot eight miles distant from Cherson; and in place of a sun-dial which he had expressed a wish to be erected over his grave, a rude pyramid marks the place where his ashes repose.

Of the diffidence, modesty, and disinterested motives of this truly great man, no better proof can be given than his shrinking from that public applause which his noble exertions in the cause of suffering humanity naturally called forth. He positively declined the spontaneous tribute of esteem and veneration proposed to be expressed by his fellow citizens in the erection of a statue or monument to his honour, while he gratefully acknowledged their kind intentions.

Mr Howard was so abstemious in his diet, that the plainest vegetables, with water, constituted his usual fare; and tea, milk, and fruits were his greatest luxuries; he was neat in his person, and shewed a fine taste in his house, furniture, and garden; regular in his habits; and so punctual in his engagements, that it is said he was never known to be a moment beyond his time. The deeds and character of Howard have been often the theme of the poet and the orator. But the fine eulogium of the eloquent Burke, exhibits his philanthropy in such glowing colours, that it is well entitled to a place. "I cannot name this gentlemen without remarking, that his labours and writings have done much to open the eyes and hearts of mankind. He has visited all Europe,—not to survey the sumptuousness of palaces, or the stateliness of temples; not to make accurate measurements of the remains of ancient grandeur, nor to form a scale of the curiosity of modern art; not to collect medals, or to collate manuscripts;—but to dive into the depth of dungeons; to plunge into the infection of hospitals; to survey the mansions of sorrow and of pain; to take the gauge and dimensions of misery, depression, and contempt; to remember the forgotten; to attend to the neglected; to visit the forsaken; and to compare and collate the distresses of all men, in all countries. His plan is original; and it is as full of genius as it is of humanity. It is a voyage of discovery, a circumnavigation of charity; and already the benefit of his labour is felt more or less in every country."

HOWITZER, a kind of mortar, which is mounted upon a field carriage like a gun. See *Gunnery*, under War.

HOY, one of the Orkney islands of Scotland, lies to the southward of Pomona or the Mainland, from which it is separated by a narrow strait. See Orkney Islands.

HUAHEINE, one of the Society islands in the Southern Pacific ocean, was discovered by Captain Cook in 1769. See Society Islands.

HUDDERSFIELD, a town of the West-Riding of Yorkshire, contains nearly 10,000 inhabitants, and has been long famous for its woollen manufactures.

HUDSON, Henry, an enterprising English navigator, of whom nothing is known till the year 1607, when he sailed in a small vessel, equipped by some London merchants, to explore a north-east passage to China. In this voyage, he advanced into the north sea beyond the 80th degree of latitude, when his progress was interrupted by the ice, and he returned to England in September; in a second voyage the next year, he landed in Nova Zembla; and in a third voyage, for which he was fitted out by the Dutch East India Company, after another unsuccessful attempt to the eastward, he steered for the American coast; but his mutinous crew prevented him from exploring a westerly passage through Davis's Straits.

In the year 1610, Hudson sailed on his last voyage in the month of April; and having come within sight of Greenland, proceeded westward in the 60th degree of latitude, and entering the strait which bears his name, passed along the coast of Labradore, which he called New Britain, till it terminated in the spacious bay which still retains his name and commemorates his discovery. He wintered in the southern part of the bay, and although reduced to great extremities from want of provision, he fitted out his vessel in the spring to attempt farther discoveries. The want of supplies compelled him to relinquish the attempt; and having distributed what little bread remained among his people, he prepared to return. Having threatened to set some of his men on shore on account of their mutinous conduct, he was anticipated by their seizing him in his cabin in the night, tying his hands behind his back, and putting him on shore at the west end of the straits in his shallop, with eight of those most attached to him, who were in general sick and infirm, and one of them was his own son. No tidings were ever heard of their fate, but it can scarcely be doubted that they either perished in the waves, or, if they reached the land, that they died for want.

HUDSON, William, an eminent English botanist, was a native of Westmoreland, and settled as an apothecary in London. He was the author of *Flora Anglica*, which first appeared in 1762, in one volume 8vo. and was enlarged in 1778 to two volumes. In this work, the plants are arranged according to the Linnæan system. Mr Hudson's pursuits extended also to other branches of natural history, and particularly to the shells and insects of Great Britain. He died in 1793.

HUDSON'S BAY, which derives its name from the English navigator, Henry Hudson, by whom it was discovered in 1610, from the head of James's bay on the south, to Repulse bay on the north, extends between the 52d to the 67th degree of north latitude, and the 79th the 94th of west longitude. The entrance to this spacious bay is by Hudson's strait, the south side of which is formed by the coast of Labradore. Numerous islands, as well as rocks and sand banks, are scattered over its surface.

Hudson's Bay.

Of these islands, Southampton, stretching 100 leagues from north to south, and lying opposite to the strait, is the largest. Marble island, Carleton island, the isle of Good Fortune, and Resolution island are of smaller extent. James's bay in the south-east corner, Button's bay on the west, Chesterfield inlet on the north-west coast, and Roe's Welcome and Repulse bay on the north, are the principal bays. The chief rivers are the Great Whale, East Main, Rupert, Moose, and Albany, which discharge their waters into James's bay, and the Severn, Nelson, and Churchill, which flow from the west. That district of country which forms the boundary of Hudson's bay on the east, and which is called East Main, is part of Labradore; the south-west coast is called New South Wales, and the regions on the north west, of which little is known, are distinguished by the appellation of New North Wales.

Climate.—The climate of Hudson's bay is remarkable for its severity. In some places, Fahrenheit's thermometer stands at 50° below zero in January. The snow begins to fall in October, and the country continues covered with it till the middle of May; but during the intense cold, the atmosphere is often clear and serene; the stars shine during the night with great brilliancy; the northern lights, darting with extreme velocity through the hemisphere, exhibit an endless variety of beautiful colours; and mock suns and moons are frequently seen. During the short summer the thermometer frequently rises to 90°, and, with all its severity during a considerable part of the year, the climate is not unfavourable to the health of Europeans.

Natural History.—The mountains, bare and rugged, rise to a great height; and the vallies, in which lakes formed of collections of snow or rain water are distributed, are not less barren. Beyond the 60th degree of latitude vegetation ceases; but, in general, the soil and climate are extremely unfavourable to the growth of plants, of which the moss tribes, some of the grasses, and pines, poplars, and junipers of stunted size, are all that have been discovered in that inhospitable region. At Moose and Albany forts, the more common productions of the kitchen garden are successfully cultivated. The cranberry, the raspberry, and the strawberry grow spontaneously as far north as Churchill river. The lakes and rivers in the more southern districts abound with fish; and indications of iron, lead, and copper ores, have been observed in the mountainous regions.

The feathered tribes are numerous, and especially some kinds of sea-fowl; and the principal quadrupeds are the moose-deer, the rein-deer, the buffaloe, and musk-ox; bears, wolves, and foxes; beavers, otters, and ermines; hares, squirrels, and mice. The fur of some of the animals now enumerated constitutes the chief commercial commodity that has excited the enterprise of Europeans to visit the shores of Hudson's bay.

Inhabitants.—The native inhabitants of the territories surrounding Hudson's bay are the northern and southern Indians and the Esquimaux. The northern Indians possess that extensive region which lies between the 59th and 68th degrees of north latitude. They are of a copper colour, have black straight hair, and are a robust hardy race. They are chiefly employed in hunting and fishing; and they are clothed with the skins of animals taken in the chace. The southern Indians inhabit the south coast of Hudson's bay, and resemble the Indian tribes to the north of Upper Canada. Their chief occupation is hunting or collecting furs for the Hudson's bay traders; and from their long intercourse with Europeans their moral habits have not been improved.

Hudson's Bay.

The Esquimaux are the inhabitants of the northern shore of Hudson's bay; their complexion is copper coloured; and they are of a low stature and broad figure. Their arms and domestic utensils are of inferior workmanship to those of their southern neighbours. While they are employed in fishing during summer, they live in round tents covered with deer-skins; and for their winter residence they construct small huts, which are half sunk under the surface of the ground. The Esquimaux were long engaged in deadly feuds with the northern Indians; and till of late years that the European settlers interfered, and succeeded in some degree in repressing hostilities, they were severely persecuted, and subjected to the most cruel oppression by their more powerful and daring enemies.

Settlements.—Several expeditions were fitted out for the purpose of exploring Hudson's bay after its first discovery in 1610; but no permanent establishment was made within its limits till 1668, when Zacharias Gillam was sent out by Charles II. At the solicitation of prince Rupert, Gillam erected Fort-Charles on Rupert's river, provided it with a garrison, and spent the winter on the spot; and, before his return to Britain, a charter was granted to prince Rupert and those associated with him, under the appellation of the Hudson's Bay company, conveying to them the whole trade and commerce within the entrance of Hudson's straits. With the exception of a period of 17 years, previously to 1714, when the French were the occupants, the company has enjoyed uninterrupted possession of all the privileges conferred by this grant. One of the conditions of the charter was an obligation that the company should continue to prosecute discoveries, and particularly with regard to the north-west passage.

The Hudson's Bay company have four factories, or principal settlements. Prince of Wales or Churchill fort, at the mouth of Churchill river, in latitude 59°, is the most northerly; York fort, which was called Bourbon while the French held possession, is a square building flanked with bastions, and is erected on an island formed by two branches of Nelson's river, in latitude 57° 30′; Albany fort, in latitude 52° 18′, is situated on Albany river; and Moose fort, which the French changed for St Louis, stands at the mouth of a small river on the south side of James' bay, in 51½° latitude. Besides the four principal establishments, smaller settlements have been formed for the conveniency of trade—as Severn's fort, which is a branch of York fort; and East Main, or prince Rupert's, a dependency of Moose fort.

Commerce.—Furs, skins, and feathers, are the principal commercial commodities of Hudson's bay, which are exchanged for coarse cloths, hardware, glass-beads, and a few luxuries, as tobacco and spirits.

Factors, or governors, are appointed to the different settlements to superintend the trade with the Indians. The servants of the company are usually natives of the Orkney islands, who are engaged for a term of years when the vessels in their passage out touch at these islands; and probably they are preferred not only on account of their hardy habits, but also on account of the moderate wages. It appears from the salaries of all ranks in these settlements that the trade is conducted with great economy. But it is understood of late years to have suffered considerably from the encroachments of the more active adventurers belonging to the North-West company of Canada, who, it is asserted, have extended their concerns within the limits originally assigned to the Hudson's Bay company. About 250 individuals are employed at the different settlements.

The reader who wishes for farther information relative to Hudson's bay and the fur-trade, may consult Hearne's *Travels to the Northern Ocean;* Mackenzie's *Travels in North America;* and Lord Selkirk's *Sketch of the British Fur Trade in North America.*

HUDSONIA, a genus of plants belonging to the Dodecandria class, and established to commemorate the English botanist William Hudson.

HUET, Peter Daniel, an eminent French prelate, was a native of Caen, and was born in 1630; was educated in the Jesuit's college of his native place, and made rapid progress in mathematics, philosophy, and the Hebrew language. In the study of that language he was assisted by the learned Bochart, the Calvinistic minister of the place; and having spent some time in Paris in associating with the literary characters of the metropolis, he accompanied Bochart to Sweden, which he visited on the invitation of the romantic queen Christina, who was anxious to see at her court a numerous assemblage of persons of distinguished learning. His residence at Stockholm was very short; for he seemed little disposed to encounter the rigours of a northern winter; and the only advantage that he derived from this journey was the discovery of a manuscript copy of Origen's Commentary on the Scriptures, of which he afterwards published an edition. But the first literary production of Huet is a treatise "De Interpretatione," the object of which is to limit the licence of translators within proper bounds, and especially those of the Scriptures. The elegant composition of this work, and the critical knowledge which it displayed, obtained for the author great reputation. His next treatise, on the "Origin of Penances," indicates great research and extensive reading.

In 1670 Huet was appointed sub-preceptor to the dauphin under the celebrated Bossuet, and while he held that situation he superintended the edition of the Latin classics in *Usum Delphini,* a plan which was originally suggested by the duke de Montausier, and which has proved so useful in removing the difficulties of ancient authors. Having assumed the clerical habit and profession, he was presented, as a reward for his services, to the abbacy of Aunai in Normandy, and was afterwards promoted to the bishoprick of Soissons, which was exchanged for that of Avranches, to which he was consecrated in 1692. Finding his episcopal duties incompatible with his retired habits, he was permitted to resign his bishoprick, and received as a compensation the abbacy of Fontenai, near Caen; but being harassed with lawsuits, he finally retired to the professed house of the Jesuits at Paris. He died in 1721, when he had reached the great age of 91.

The works of Huet furnish ample evidence of his learning and industry. He wrote prose Latin with great purity, and he holds no very inferior rank among modern Latin poets. He was the author of "Evangelical Demonstration," "Censure of the Cartesian Philosophy," "An Account of his own Life," in Latin; and the "History of the Commerce and Navigation of the Ancients," and "Of the Situation of the Earthly Paradise," in French.

HUGHES, John, an English poet and prose writer, was the son of a respectable citizen of London, and was born in 1677; received his education in the academy of Mr Rowe, a dissenting minister, who at the same time numbered among his pupils the celebrated Dr Watts, and some others who rose to literary eminence. Mr Hughes early discovered a taste for drawing, music, and poetry; having obtained a place in the office of Ordnance and other lucrative situations under government, he devoted the productions of his muse to public affairs, in three poems, which gained him some reputation; and from his political principles he became connected with Addison, Steele, and other literary characters, and was one of the writers in the Tatler, Spectator, and Guardian.

Mr Hughes was the author of several musical pieces, among which are enumerated "Calypso and Telemachus," an opera, and "Apollo and Daphne," a masque. Having published an edition of Spencer, and having the good fortune to obtain a still more lucrative situation, his health began to decline, but the vigour of his mind remained unabated; for during his last illness he composed the tragedy of the "Siege of Damascus," which was brought onthe stage on the very night of the author's death, in 1720. His works were afterwards collected and published in two volumes.

HUGUENOTS, an appellation, supposed to be of a contemptuous character, assigned to the Protestants of France. The origin of the name is doubtful; for while some derive it from the gate Hugon at Tours, near which they were accustomed to assemble in the night-time in subterraneous vaults, others trace it to a different origin, and think that it was bestowed on the Protestants because they were disposed to support the hereditary succession to the crown in the line of Hugh Capet. From whatever circumstance the name arose, those to whom it was attached suffered severe persecution. In consequence of the edict of Nantz, granted in their favour by Henry IV. in 1598, they enjoyed some degree of religious liberty; but the revocation of that edict by Louis XIV. in 1685, was a new era of their sufferings, when great numbers, being exiled from their native soil, retired to Britain and other countries, where they introduced many valuable mechanical arts.

HULL, or Kingston-upon-Hull, a sea-port town of Yorkshire in England, stands on the west side of a river of the same namo, and on the north side of the Humber, which latter has a communication by means of inland navigation with almost every part of England. The population of Hull is about 27,000; and the commercial enterprise of the inhabitants is not exceeded by any town in the kingdom.

HUME, David, an eminent historian and metaphysical writer, was a native of Berwickshire in Scotland, was born in 1711, and pursued his academical studies at Edinburgh, where he distinguished himself as an ardent and successful scholar. He was destined for the profession of the law, but his passion for general literature precluded him from any exclusive pursuit, so that all thoughts of entering into the dry details of legal discussion were soon abandoned; and an attempt to engage in commercial business at Bristol, was also relinquished in a few months. Resolved to devote himself to literature, he retired to France, and, during a residence of two years in that country, he was chiefly engaged in the composition of his treatise "On Human Nature," which was published in 1737, on his return to London; but severe was the mortification of the young author, when, with all the singularity of opinion which it contained, it attracted no notice; for, as he himself remarks, "it fell dead-born from the press, without reaching such distinction as even to excite a murmur among the zealots." The sentiment conveyed in these words obviously shews, that it was Mr Hume's object to bring himself into notice by the novelty of his opinions, or by their opposition to the commonly received doctrines of mankind. In 1742 his "Essays, Moral, Political, and Literary," were published at Edinburgh, and met with a more favourable reception, which was ascribed to the more popular and familiar form of the work, and the elegance of its composition. After a short residence in the family of the marquis of Annandale, Mr Hume appeared as a candidate for the professorship of moral philosophy in the university of Edinburgh. But the principles which he maintained in his first work being considered as hostile to the established religion, precluded his success.

About the year 1746 Mr Hume appeared in a new scene, when he was drawn from his literary retirement and was appointed secretary to general St Clair, who was employed in an attack upon the French coast; and in the succeeding year he accompanied the general upon a military embassy to the courts of Vienna and Turin; and thus, while he spent his time in agreeable society, he had an opportunity of extending his observations on mankind, and of adding something to his slender patrimony. But, on his return, he was again mortified to find that the first part of his treatise "On Human Nature," which appeared under the title of an "Enquiry concerning Human Understanding," was still overlooked. But this disappointment was in some degree compensated by the notice which others of his writings had begun to attract. This notice could not fail to be gratifying to one who was inspired with great ambition of a literary reputation.

In 1752, his "Political Discourses," and his "Enquiry concerning the Principles of Morals," were published in London. The first was received with immediate approbation, but the last, which he himself pronounces, to be "incomparably the best of all his writings," met with a very different fate. In the same year, he was appointed Librarian to the Faculty of Advocates in Edinburgh, a place which gave him the command of an excellent collection of books, and which it is supposed suggested the idea of commencing historian. In 1754, a quarto volume of the "History of England under the house of Stuart, and including the reigns of James I. and Charles I." appeared; and, as he says himself, contrary to his sanguine expectations, was assailed by all parties with "one cry of reproach, disapprobation, and even detestation." The cause of this opposition is assigned, by Mr Hume himself, to the compassion which he has expresssd for the fate of Charles I. and the Earl of Strafford; but it is traced with more probability to the undisguised contempt which he shews for every form of religion, and to the free exposure which he has made of the faults of all political parties. But whatever was the cause of the unfavourable reception and neglect which it experienced, the mortification of the author was so severe, that the war which at the time broke out between England and France, only prevented him from retiring to the latter kingdom, changing his name, and renouncing his country for ever. After the phrenzy of disappointment was over, he resumed his labours, and produced the second volume of his History in 1756. But in this interval he published his "Natural History of Religion," which also excited less attention than his sanguine expectations had anticipated. In 1759 his "History of the House of Tudor" was brought forward, and in 1761 two additional volumes appeared. This work, under the more general title of the "History of England," became from that period a standard book, and still continues to be one of the most popular historical compositions in the English language; and although Mr Hume is charged with some partialities in favour of the Stuarts, his enlarged and philosophical views of events and characters, his acuteness and sagacity in the deduction of causes and effects, his judicious selection of the proper topics of history, and his perspicuous and agreeable style, deservedly entitle it to that preference.

Having secured an independence with the profits derived from his works, Mr Hume had resolved to retire to his native country; but in 1763 he accepted of an invitation from the earl of Hertford to accompany him on his embassy to Paris, and on his arrival in that capital was appointed his secretary. As his character as a writer and philosopher was well known in France, he was greatly caressed not only by men of letters, but by all persons of rank and fashion. He returned to England in 1766, when he was accompanied by Rousseau, who was induced to visit this country as an asylum from persecution. But although it is understood that Mr Hume was in all respects kind and generous to the stranger, yet he could not preserve friendship with a man whose mind was so full of suspicion and caprice. In the following year Mr Hume again appeared in a public capacity, in the office of under secretary of state, which he held under general Conway, till the resignation of the latter in 1769. Retiring to Edinburgh, Mr Hume drew around him a select party of agreeable associates, with whom he lived on easy and familiar terms, and by whom he was greatly admired and respected, as well as by those whose opinions on many subjects were very different from his own. His health began to decline in 1775; in April 1776 he drew up a sketch of his own life; and, contemplating his approaching dissolution not only with tranquillity, but with all his habitual gaiety, he died in August of the same year.

The portrait drawn of Mr Hume's character by the hand of friendship, represents it as approaching as nearly to that of a perfectly wise and virtuous man as perhaps the nature of human frailty will permit. The desire of literary fame seems to have been his ruling passion, to which, with some probability, may be traced that fondness for speculation on subjects of the deepest importance to mankind. But it may be doubted how far any apology can be advanced for a writer who attempts to subvert the commonly received opinions of the foundations of virtue and religion, without being able to establish a single principle on more solid ground, that might give even some degree of plausibility to his theoretical views. His "Dialogues concerning Natural Religion," a posthumous publication, appeared in 1779. In 1783 "Essays on Suicide" were published in his name; in this work some of his most obnoxious principles are detailed with far less caution and circumspection than in any of his former writings; and in 1820, "Letters" said to be part of Mr Hume's correspondence never before published, have appeared; and although they bear evident marks of being written in Mr Hume's manner, yet the admirers of the historian and philosopher would be glad to see any of his friends come forward with an open disavowal that they are spurious productions. His correspondence with Madame Boufflers, whatever might be his admiration of her talents and accomplishments, is not very honourable to his moral feelings, and it is extremely offensive to virtuous delicacy. This lady had separated from her husband, and was living at the very time as the mistress of the Prince de Conti.

HUMULUS, THE HOP, a genus of plants belonging to the Dioecia class. See BREWING.

HUNDRED, a subdivision of a county in England which was instituted in the time of Alfred, either because it contained a hundred families or furnished a hundred men able to bear arms.

HUNGARY, a kingdom of Europe, subject to Austria, is included between 44½° and 49½° of north latitude, and between 15° and 26° of east longitude, and has for its boundaries on the north the Carpathian mountains, on the south and east part of Italy, and the Turkish dominions and the states of Germany on the west, and is more than 400 miles in length from west to east, and about 260 miles in breadth from north to south. It is sometimes divided into Upper and Lower Hungary, the former of which is that part lying to the eastward, and the latter comprehends the western portion. According to another division, of more modern date, Hungary forms four great circles, which are subdivided into counties.

Hungary presents a very diversified aspect. A large proportion of its surface is covered with lofty and barren mountains, some of which are covered with perpetual snow, and rise more than 7000 feet above the level of the sea. The lakes and morasses are numerous, the forests are very extensive, and the sheltered valleys are fertile and productive. The northern division of the Carpathian mountains consists of primitive rocks, among which granite and limestone seem to predominate. Micaceous and argillaceous schistus are also frequent, and free-stone, porphyry, and basalt, are not uncommon. The repository of the opal, which is dug out at Caschau, is a decomposed porphyry.

Rivers.—With the exception of the Danube, which traverses part of Hungary, the rivers of that country have their origin in the Carpathian mountains, and finish their course by joining the Danube or the Thiesse, which, next to the Danube, is the largest stream that passes through this country. The Thiesse is at first a rapid river, and directing its course towards the west and south it runs more than 400 miles, and falls into the Danube near Belgrade. The Drave, which rises in the Tyrol, is navigable in every part of its course through Hungary; and besides the rivers now mentioned, some others are confined to Hungary itself or pass through part of its territory. Some of the lakes are of considerable extent; and the inundations of the rivers in their course through the flat country form numerous marshes in their vicinity.

Natural history.—Hungary has been long rich in metallic ores; and the valuable mines at Schemnitz and Cremnitz have been often very productive. Native gold is collected by washing the sand in the beds of the rivers, or the soil to a certain depth in their vicinity; and both gold and silver are extracted from minerals dug out of the metallic veins. Some of the copper mines have been occasionally very productive; lead has also been wrought; and the ores of iron are very abundant. The mines of Hungary, and particularly those of Schemnitz, Cremnitz, and Konigsberg, furnish many of the finest specimens of gold and silver ore, as well as of the ores of other metals which adorn the cabinets of mineralogists. Rock-salt is dug out to a considerable extent.

The forests of Hungary, especially in the northern and western divisions, cover a great extent of surface. They are chiefly composed of pine, oak, ash, hazel, and linden trees, and are not only profitable to the proprietors but afford occupation to the industry of the inhabitants.

Numerous herds of cattle are reared on the pastures of Hungary. A very valuable breed has been introduced, and great numbers are sold out of the country. The flocks of sheep are not less numerous, and of late years attention has been paid to the improvement of the wool. The number of hogs raised in the country is very great. The horses, although generally of small size, are a hardy race, and well formed. The principal rivers abound with sturgeon, salmon, pike, and other kinds of fish; and the rearing of bees and silk-worms is a valuable branch of industry.

Hungary.

Huns
Hunter.

Population.---The population of Hungary is estimated at more than six millions and a half, and it is composed of Hungarians, Slavons, Wallachians, and Germans. The Huns, or Hungarians, from whom the name of the country is derived, invaded it about the close of the ninth century, and took possession of the most fertile districts. The western division of Hungary, and the greater part of the lower plains, are in their occupation. They are chiefly occupied in rural affairs, and are greatly attached to a military life. The Slavons, including Croats, Vandals, and Servians, are a more numerous race; the Wallachians, supposed to be descended from the ancient Roman colonists, inhabit that part of the Bannat which is contiguous to Wallachia; and the Germans, composed of colonists who emigrated chiefly from Suabia, are distributed over the kingdom. The gypsies form a numerous race in Hungary, and although attempts have been made to civilize them; they are still attached to their ancient habits. In summer they are employed in washing gold from the sand of the rivers, and during the rest of the year they wander about as braziers, blacksmiths, or musicians.

Religion.—The established religion of Hungary is that of the church of Rome; but all religious sects are tolerated. The estimated number of Roman catholics is about two-thirds of the whole population. Many of the inhabitants are attached to the Greek catholic church, the Greek schismatic church, as well as the Lutheran church, and Reformed evangelical church. The Jews have synagogues in different parts of Hungary; and a few anabaptists are found in some of the towns.

Government.—The government of Hungary is to be regarded as a limited monarchy. After many severe struggles the sovereign authority has been long held by the archdukes of Austria, and the right of succession has been established in the descendants, whether male or female, of that house. The diet of the state is composed of the prelates, the barons, and the representatives of counties and of free cities.

Husbandry.—In many parts of Hungary the soil is rich and fertile, but agriculture is in a very low state of improvement. Wheat is one of the principal crops in the less elevated districts; and oats, barley, and rye, are produced in such abundance as to permit the exportation of a good deal of grain to Germany and Italy. Maize, rice, potatoes, and turnips, are enumerated among the cultivated products; as well as lint, hemp, and poppies; and dye-stuffs, as madder, woad, and saffron. The vineyards of Hungary, which are very extensive, afford wines of an excellent quality, and the fame of Tokay wines has been long celebrated throughout Europe. Other fruits, as apricots, peaches, apples, and pears, are abundant; and plums thrive so well that extensive plantations have been established; and the produce of fruit, both in its fresh and dried state, is exported to Germany.

Manufactures, &c.—Woollen and linen cloth is manufactured throughout the country. The manufacture of cotton has been lately introduced, and employs many of the inhabitants; and paper, tobacco, soap, leather, earthen-ware, glass, the smelting of copper and iron, and the distillation of spirits, are also valuable branches of industry. A great deal of the commerce of Hungary is conducted by travelling merchants, who attend the numerous fairs which are established throughout the country. Among the exports are enumerated grain, tobacco, gall nuts, honey, wax, potashes, wine, cattle, wool, skins, and tallow; and the imports from Austria and Turkey are, coffee, sugar, spices, and various luxuries.

The principal towns or royal free cities of Hungary are, Buda and Pest, Debretzin and Presburg; and the towns properly so called contain from ten to twenty thousand inhabitants, while some of the villages of Lower Hungary have a population of several thousands.

Buda is the capital of the circle of Pest, and the chief city of Hungary, stands on the west bank of the Danube, and, by means of a bridge of boats, has a communication with Pest on the opposite bank of the river. The united population of the two places is estimated at nearly 50,000. See Buda.

Debretzin is a town of Upper Hungary, consisting chiefly of thatched houses, and containing about 30,000 inhabitants, who are occupied in the manufacture of woollen stuffs, soap, saltpetre, and tobacco-pipes.

Presburg is the chief town of Lower Hungary, stands on the banks of the Danube, and is about 46 miles eastward from Vienna. Previously to 1784, Presburg was the capital of the kingdom, and the place for the assembly of the states. The population is estimated at 27,000.—See Baron Born's *Travels in Hungary*, Townson's *Travels in Hungary*, and Clarke's *Travels*.

HUNS, a Tartar race, who, from their original territory on the borders of China, advanced to the southern and western counties of Europe some centuries before the Christian era; but in the fifth century of that era, under their leader Attila, they invaded the Roman empire, and threatened it with total destruction. Two different nations have been distinguished by the appellation of Huns. The Nephthalite or White Huns, who inhabited a rich country on the confines of Persia, and the Sarmatian or Scythian Huns, a more barbarous race of people. From the Huns, it is conjectured, the name of Hungary is derived.

HUNTER, William, an eminent physician and anatomist, and founder of the Hunterian museum in the university of Glasgow, was a native of the parish of Kilbride in Lanarkshire in Scotland, and was born in 1718. Being destined for the church, he spent five years at the college of Glasgow in the pursuit of his academical studies; but having changed his views, he became a pupil of the celebrated Cullen, who was then a practitioner at Hamilton, and lived with him three years for the purpose of qualifying himself for the medical profession; and after completing his studies in Edinburgh and London, it was settled, by a subsequent arrangement, that he should return to Hamilton and become the partner of his master.

Having spent a winter in Edinburgh, Mr Hunter made a visit to London in 1741; and being recom-

Hunter. mended to Dr Douglas, the teacher of anatomy, he was admitted into his family in the double capacity of tutor to his children and assistant in his anatomical pursuits; even after the death of his friend and patron in the course of a few months, he remained with his family; and, availing himself of every opportunity that offered of improvement, continued to prosecute his studies with great zeal and diligence, of which he gave satisfactory proof in a "Memoir on the Structure and Diseases of Articulating Cartilages," presented to the Royal Society in 1743.

Confident of his own talents, and ambitious of public distinction, Mr Hunter began to entertain thoughts of teaching anatomy; but, as usual on those occasions, he received little encouragement to proceed from those to whom he first communicated his scheme. A favourable opportunity at last presented itself, when Mr Sharpe, after repeating several courses of lectures on the operations of surgery, finding it incompatible with his professional engagements, declined the task in Mr Hunter's favour. He commenced his labours in the winter of 1746, and, extending the plan of the course, included anatomy. His first course of lectures was both well received by his audience and profitable to himself; but his liberality in supplying the wants of some friends embarrassed him so much, that he was unable, it is said, to defray the expence of advertising for next season, and his lectures were thus delayed for a fortnight.

In 1747 he was admitted a member of the corporation of surgeons; and in the spring of the succeeding year, accompanied by his pupil Mr Douglas, he visited France and Holland. In the commencement of Mr Hunter's practice it embraced both surgery and midwifery, but was afterwards confined to the latter. His appointment of surgeon to the British Lying-in-hospital, served to bring him into public notice; and the reputation of his talents, as well as his manners, contributed in no small degree to his success in that department of the profession to which he had resolved to confine himself. With this view he obtained in 1750 a medical degree from the university of Glasgow, and fixed his residence in Jermyn street. In the succeeding summer he made a visit to Scotland, where he spent a few weeks with his friends, among whom may be mentioned Dr Cullen, who was now established at Glasgow, and had acquired considerable reputation, both as a practitioner and teacher of physic; and, excepting on professional business, Dr Hunter was never afterwards absent from the metropolis. In 1755 he was appointed physician to the British Lying-in-hospital; and in 1762 commenced a controversy relative to his claim to different anatomical discoveries, and particularly with regard to the discovery of the origin and use of the lymphatic vessels, for the discovery of which a counter-claim was made by the second Dr Monro. In this dispute, as often happens where the parties are scrupulously tenacious of their supposed rights, a great deal of violence and acrimony appeared; and after all, some of the discoveries were known to anatomists before the time of either of the claimants. Dr Hunter was peculiarly tenacious on such points, as appeared in a controversy with his own brother, which came before the Royal society in 1780; and, to say the least of it, such a controversy, whatever be its merits, can never be regarded as decorous or creditable to the parties concerned. Hunter.

The celebrity of Dr Hunter as a teacher and medical practitioner, or the interest which he could command, or perhaps their united influence, now brought him within the sunshine of royalty. About the year 1764 he was appointed physician extraordinary to the queen—an era from which he could date a great increase of professional employment. A few years afterwards he was nominated by the king professor of anatomy to the Academy of Arts recently instituted; and was thus led, by the application of anatomical knowledge to painting and sculpture, into a new field for the exercise of his genius. Soon after his admission as a member of the Royal society, he communicated to that body observations on the bones of large animals found on the banks of the Ohio in North America, as well as other memoirs on subjects of natural history; and as his reputation extended beyond the limits of his own country, he was enrolled as an associate of learned foreign institutions.

Dr Hunter's numerous professional avocations required that he should have some relief from the labour of teaching; in this labour he first had the assistance of Mr Hewson, who had been his pupil, and was afterwards assumed as a partner in his lectures; but a dispute having arisen, a separation took place about the year 1770; and Mr Cruickshanks was afterwards associated with Dr Hunter as an assistant and partner in his anatomical lectures.

The splendid work on the *Gravid Uterus*, on which Dr Hunter had been long engaged, was brought forward at a very great expence, and presented to the public in 1775. The anatomical descriptions were completed by Dr Baillie, and published in 1794. "Reflections on the section of the Symphysis Pubis," and "Two Introductory Lectures to his Anatomical Course," the latter a posthumous publication, complete the list of his separate works.

Dr Hunter, who had now risen to the summit of his profession, steadily persevered in his labours till the year 1783, when he was seized with a fit of the gout, to which he had been occasionally subject during the latter part of his life. In a few days he was so far recovered as to be able to deliver his introductory lecture to the operations of surgery; but he was so much exhausted toward its conclusion that he fainted away. The alarming symptoms continued to increase; he was seized with a partial paralytic affection; and in ten days from his last appearance in public he expired.

Dr Hunter was represented as a man of a mild and sedate character, engaging in his manner and address; and in his attention to his patients never failing to conciliate their confidence and esteem. In his mode of life he was extremely simple and frugal; he rose early in the morning, and devoted all his spare hours to his anatomical pursuits, or to the arrangement of his museum; yet he is said to have been cool in his social feelings, somewhat irritable in his temper, and not a little jealous of his reputation.

As a teacher of anatomy he was deservedly celebrated. He was accurate in his conceptions, perspicuous in his demonstrations, and peculiarly fortunate in apposite illustrations of his doctrines.

Dr Hunter having for some time contemplated the scheme of establishing an anatomical school in the metropolis, drew up a memorial in 1775, and presented it to the minister, for the purpose of obtaining a grant of a piece of ground in the Mews, on which he proposed to erect the necessary buildings. In promoting this plan he proposed to expend L.7000 on the building, and to endow a professorship of anatomy. But his proposal having met with no very favourable reception, although some of those in power who were friendly to it suggested that it might be carried into effect by subscription, Dr Hunter purchased a spot of ground in Great Windmill street, erected a spacious house, with a handsome amphitheatre and other commodious apartments for lectures and dissections, and an elegant room fitted up for a museum.

Dr Hunter is well entitled to the grateful recollection of posterity, on account of the magnificent museum which now forms so conspicuous an appendage to the university of Glasgow, to which it was bequeathed. Previously to the year 1770, when he removed to his new apartments in Great Windmill street, his collection was chiefly confined to subjects illustrative of human and comparative anatomy, and of diseases. It was then extended to minerals, shells, corals, and to ancient coins and medals, besides an excellent selection of Greek and Latin classics. The coins and medals are highly valuable, and a description of the former was drawn up by Dr Combe. The expence of the whole collection has been estimated at more than L.20,000; and beside this splendid bequest, Dr Hunter left L.8000 as a fund for the support and augmentation of the collection. By Dr Hunter's will the museum was left to his nephew, Dr Baillie, during his life, and to Mr Cruickshanks for a period of 30 years; but on the death of the latter, Dr Baillie liberally resigned his right; and long before the period fixed by Dr Hunter had expired, the collection had reached its ultimate destination, where it is now recognised under the appropriate appellation of the Hunterian Museum.

HUNTER, John, an eminent surgeon and anatomist, was a younger brother of Dr William Hunter, and was born in 1728. His early education is said to have been greatly neglected through excessive indulgence; and having discovered some mechanical dexterity, he was placed as an apprentice with his brother-in-law, a carpenter and cabinet-maker in Glasgow. But in a short time that business having failed, young Hunter was thrown out of employment. According to another account, which was at one time prevalent in his native parish, he was compelled to leave Glasgow in consequence of having defended himself against some of the soldiers of the Pretender's army, who had attempted to rob him of his shoe-buckles. Whatever was the cause, he left Scotland in 1748, and, on his arrival in London, commenced his labours in anatomical dissection, in which he soon discovered so much dexterity that, in the succeeding year, he was qualified to undertake the instruction of the pupils of his brother in that branch of anatomy. Mr Hunter's studies were, at the same time, directed to the acquisition of the practical knowledge of surgery, first at Chelsea hospital, and afterwards at St Bartholomew's; and about the same time, with the view of acquiring some literary distinction, he was entered as a gentleman commoner at St Mary's Hall, Oxford, although it does not appear that his attendance at the university was resumed, or of sufficient length of time to entitle him to academical honours.

In 1755, Mr Hunter was admitted by his brother to a partnership in his lectures; and, in the following year, he was appointed house-surgeon to St George's hospital. With such advantages, and with the zeal and enthusiasm which he possessed, he could not fail to become an expert anatomist and a dexterous surgeon. His assiduity and perseverance in the labour of dissection were almost incredible; and his anatomical preparations held a conspicuous place in his brother's collection. When he found himself familiar with the anatomy of the human body, he turned his attention to comparative anatomy, for the purpose of elucidating the vital functions by analogical observations; and with all the ardour of enthusiasm, he lost no opportunity that offered of examining rare animals; while he procured from the tower, and from the keepers of wild beasts for public exhibition, the bodies of such as died in their custody.

In the prosecution of these labours, Mr Hunter's industry and perseverance were so indefatigable as to affect his health, for the recovery of which he entered the army as a staff surgeon in 1760, and served in that capacity in the expedition against Belisle, and in Portugal, till the year 1763, when he returned to London, and settled as a surgeon; and while he delivered courses of practical anatomy and the operations of surgery, he pursued with undeminished zeal the study of comparative anatomy. To enable him to carry on his experiments with greater facility he purchased a piece of ground at Earl's Court, Brompton, built a house upon it, and fitted up commodious apartments for foreign and rare animals, that he might have an opportunity of watching more closely their manners and habits.

In 1768, Mr Hunter succeeded his brother in his house in Jermyn-street, was admitted a member of the Royal college of Surgeons, and in the following year was elected one of the surgeons to St George's hospital. In 1771 appeared his first publication, a quarto volume, "On the Natural History of the Teeth;" and in the same year he married the daughter of Mr Home, a military surgeon. This connexion, it is probable, was not unfavourable to Mr Hunter's professional success. The lady was possessed of elegant accomplishments; and, from a volume published since his death, has acquired some poetical celebrity.

In 1773 he commenced a course of lectures on the Theory and Practice of Surgery, in which he brought forward many opinions, some of which were characterized by their boldness and originality, and while they became the subject of controversial discussion, they served to introduce a peculiar language and reasoning into the schools of medicine. In 1776 he was appointed surgeon-extraordinary to the army; two years afterwards he published the practical part of his treatise "On the Teeth," in which the diseases are treated; and, in 1783, he removed to Leicester-square, where he had purchased a house, to which he annexed, at a great expense, a spacious building for the reception of his museum. A few years afterwards he was appointed deputy surgeon-general to the army; and, in 1790, was raised to the office of inspector-general of hospitals and surgeon-general. His time was now so fully engrossed by his professional avocations, public and private, that he resigned his course of lectures to his brother-in-law, now Sir Everard Home, and devoted any little leisure he could command to his favourite pursuits. Previously to this period, he had published a long expected work "On Syphilis," which, although it was severely criticised, has been very generally read. About the same time also, he published "Observations on various parts of the Animal Economy," chiefly consisting of memoirs formerly communicated to the Philosophical Transactions.

Mr Hunter had been long subject to a spasmodic affection of the breast, which, for three years preceding his death, had increased in violence and frequency, and portended to himself, as well as to his medical friends, a sudden and fatal termination. This complaint was invariably induced by any unusual bodily exertion or mental agitation. While he was at St George's hospital some thing happened in the routine of business which produced considerable irritation; and having withdrawn to another apartment, he was in the act of turning round to one of the physicians, when he uttered a deep groan and dropt down lifeless. This event took place in October 1793.

Mr Hunter is represented as a man of an open and undisguised character; but in temper warm, impatient, and easily irritated. He was distinguished by the originality of his genius, and the vigour of his powers of investigation; and was not less conspicuous for his indefatigable industry and unceasing perseverance. His treatise "On the Blood, Inflammation, and Gun-shot Wounds," was a posthumous publication, in which he maintains, on fanciful and untenable grounds, the singular opinion of the life of the blood,—a doctrine which has probably met with few advocates among those who are capable of thinking for themselves. In his lectures, the want of a regular literary education was too apparent, for he was deficient in the methodical arrangement of his thoughts as well as in the perspicuity of his language. His reading was confined; and while he pursued the train of his own thoughts, he was led to adopt opinions which, however ingenious, were often liable to serious objections, or were altogether untenable. But it must be admitted that he introduced some essential improvements in the practice of surgery; and his perfect knowledge of anatomy, with the dexterity of hand that he possessed, gave him great confidence in his operations, and enabled him to undertake and perform cures which were declared impracticable.

In the collection and preparation of the subjects for the illustration of comparative anatomy, Mr Hunter has raised a lasting monument of his industry, perseverance, and enthusiasm in a favourite pursuit, in which no time or money was spared. The grand object of this collection is to exhibit the gradations of nature, from the simplest state of animal existence to the most complicated mechanism, as is seen in the human body. The preparations for the elucidation of this system are arranged in four classes, according to the several functions which are meant to be explained; they consist of an immense number of objects taken from the different orders of nature; and the series of entire animals preserved in spirits, and many of them very rare, is very extensive. By his will, Mr Hunter directed his museum to be offered to government for an adequate remuneration. The purchase was made at the price of £15000; and the College of Surgeons, to whose possession it was committed, were appointed trustees, on condition that an annual course of lectures should be delivered for its illustration, and that it should be exhibited to the public on certain days of the week. To the fulfilment of these conditions every attention has been paid.

HUNTING, which is the occupation of man in the early ages of society, for the purpose either of taking such animals as are necessary for food, or of destroying such as are injurious to him, becomes, in more civilized times, among all nations, a favourite sport or diversion. See SPORTS and PASTIMES.

HUNTINGDONSHIRE, an inland county of England, bounded on the north-east and part of the south by Cambridgeshire, on the north and west by Northamptonshire, and partly on the south-west by Bedfordshire; is of an irregular form, and is about 24 miles in length, and nearly the same in breadth; and the superficial area is estimated at from 210,000 to 220,000 acres.

Aspect.—Huntingdonshire, excepting Rutland, is the smallest county in England, and derives its name from the upland parts in ancient times having been a forest well adapted for the chace. It was disafforested by Henry II. III. V. and Edward I. The woodlands are now of small extent, and timber is scarce and greatly in demand. The fenny part of the county is in the Bedford level, and occupies about 44,000 acres, 8000 or 10,000 acres of which are productive, and the skirty lands cover 5000 acres. The county also contains three varieties of surface; the south-east part through which the Ouse flows, consists of excellent meadows, the most considerable of which is Portsholme Mead; the middle and western parts are clothed with woods and cornfields; and the upland parts are characterised as ancient forest lands. The meadow lands occupy 1200 or 1400 acres.

Rivers.—The Ouse and the Nen are the principal rivers. The Ouse, which in contradistinction to the river of the same name in Yorkshire, is called the Lesser Ouse, enters this county from Bedfordshire, is in its course increased by some small streams, and forms, near Holywell, the boundary between Huntingdonshire and Cambridgeshire; and it is navigable across the county. The Nen rises in Northamptonshire, and near Elton forms the boundary between that county and Huntingdonshire. A number of small streams and large meres or pools, water the north-east side of the county; and Whittlesea mere is much frequented by pleasure parties, for sailing and fishing.

Husbandry.—Huntingdonshire is not now so remarkable for agriculture as it is said once to have been. Godmanchester, in particular, was celebrated for agriculture, and considered the largest village in England. As a proof of this, James I. when he passed through it, on his journey to England to take possession of the throne, was met by the inhabitants with 70 new ploughs, drawn by as many teams of horses. But although Huntingdonshire is comparatively little adapted for the progress of agriculture, improvements have been effected in the management of the fen-lands, and the fen-men are remarkably expert at the plough. The common produce of the county is wheat, barley, oats, hemp, rape, turnips, hops, and great abundance of mustard.

Dairy farming is little followed, though the celebrated Stilton cheese derives its name from a village of this county, where it is supposed to have been made before it was known in Leicestershire. The breed of sheep is of a mixed description; the cattle are of the Lancashire, Leicestershire, and Derbyshire breeds; the oxen are purchased for grazing, and are never used in husbandry. The expence of freeing the fens from inundations, owing to a wrong system of drainage, amounts to one-third of the rents. Engines upon a large scale are used for the purpose of throwing the water out of the lands into the rivers.

Population, &c.—Huntingdonshire is divided into four hundreds, Normancross, Toseland, Hurstingstone, and Leightonstone; contains one county town, six market-towns, and 104 parishes; is included in the province of Canterbury and diocese of Lincoln; is in the Norfolk circuit, and sends four members to parliament, two for the county and two for Huntingdon. The population in 1811 amounted to 42,208. Huntingdonshire and Cambridgeshire are under one civil administration.

Manufactures.—Excepting wool stapling, and spinning, the manufactures are inconsiderable. Lace is made at Kimbolton, and a large papermill is worked by patent-machinery at St Neots. The markets for live cattle are among the greatest in England.

Huntingdon, the county town, is situated on the northern side of the river Ouse, and nearly connected with the village of Godmanchester; consists of one principal street, from which a number of small streets branch off; and the houses, which are of brick, are well constructed. Among the public buildings, are two old churches, two meeting-houses, the county gaol, and the town-hall, in the under part of which the civil and criminal courts are held, and the upper part is occupied as an assembly room, and adorned with portraits of George II. III. and their queens, and of lord Sandwich. A free grammar-school, which is well endowed, and a charity-school for 24 poor boys, are established, and the town contains some good inns. The population in 1811 amounted to 2,397. Some trade in brewing, and in the manufacture of vinegar, is carried on; and in return for the corn of the surrounding country, coals, wood, and other commodities, are brought in barges from Lynn, in Norfolk. Oliver Cromwell was a native of this town.

Kimbolton is a small town, situated on the east side of the county, contains a church, and is chiefly remarkable for the castle of the same name in which Catherine queen of Henry VIII. died in 1535. The population is nearly 1300.

St Neots is a pleasant town on the banks of the Ouse, and connected by a bridge with the village of Eynesbury or Aynsbury. It consists of a large market-place and several streets; contains one of the most splendid churches in the county, and the population is about 1800.

St Ives is a small town, also situated on the banks of the Ouse, over which there is a bridge of six arches, and it includes the two manors of Slepe and Bustellers. The church is a very handsome edifice, with a tower surmounted by a spire. The market for cattle, sheep, poultry, and pigs, is one of the largest in the kingdom, and two fairs are well frequented. Three breweries, and some malt-kilns, are established, and the inns are numerous. The population is about 2000.

Godmanchester is situated opposite to Huntingdon on the river Ouse, contains a spacious church and a free grammar school, which is in a flourishing state. The houses are of brick, and well built; and the population in 1801 was nearly 1400. Godmanchester was for many centuries noted for good husbandry; and agriculture is still carried on to some extent.

Ramsey is a small town, with a population of about 1900; is celebrated for an ancient abbey, of the ruins of which the gateway now only remains. The church is elegant and commodious, and a charity school for girls is established. The situation of the town is favourable for the sale of live stock. Whittlesea-mere, a lake about five miles in length and three in breadth, and abounding in fish, is north from the town.

Yaxley is an ancient market-town, with a population of about 1000; and the church is remarkable for a fine spire.—*Beauties of England.*

HURA, Sand-Box Tree, a genus of plants belonging to the Monœcia class. See Botany.

HURON, a spacious lake of North America, which is about 1000 miles in circumference, and has a communication on the one hand with lake Superior, and on the other with the lakes Michigan and Erie. See *Hydrography* under Geology, and Canada.

HUSBANDRY, a term which includes every department of rural affairs; while agriculture, in the strict meaning of the word, denotes the cultivation of the soil. But the latter word is often employed with the same extensive signification. See Agriculture.

HUSS, John, an eminent Bohemian divine, and martyr to his religious opinions, was born in 1373, educated at the university of Prague, and was appointed pastor of a church in that city, and afterwards professor of divinity in the university; and he soon distinguished himself by his learning and eloquence, as well as by the gravity and simplicity of

Huss.

his manners and life. The marriage of Richard II. of England with Anne of Bohemia, naturally led to an intercourse between the two countries; and in this way the writings and opinions of Wickliffe became well known at the university of Prague, which was at last divided into two sects, the *Realists* and the *Nominalists.* Huss and his friends attached themselves to the former, and thus excited the resentment of the opposite party; and when he was elevated to the rectorship of the university, he began openly, and with great freedom, not only to expose the vices and corruptions of the clergy, but also to recommend the peculiar opinions which he had adopted. In all this he was powerfully supported by his friend Jerome of Prague; their united exertions made a strong impression upon their countrymen; and their preaching was attended by immense crowds. The papal authorities took the alarm; the archbishop of Prague issued mandates to have the writings of Wickliffe delivered into his hands, that such as contained errors or heresies might be destroyed; Huss and his adherents resisted these mandates; the pope at last interfered, and issued his authority to have the writings of Wickliffe condemned; and Huss, after an appeal to the head of the church, was ordered to appear in person at Rome. Huss being assured of the protection of the king of Bohemia, declined the summons, but sent deputies to excuse his absence, and to answer the charges that were brought against him. The investigation terminated in a sentence of excommunication against the reformer himself, and finally against all those who were attached to his opinions.

These strong measures did not intimidate Huss and his adherents from preaching against the tyranny of the pope and the vices of the clergy. The warmth of his own temper, and a similar spirit which was infused in his followers, led them often to indulge in such violent invectives as were little serviceable to their own cause, and tended greatly to excite the indignation and resentment of their opponents. The sale of indulgencies, and the encouragement of crusades were practices against which the reformer declaimed; and as a crusade was at this time proclaimed against the king of Naples, in consequence of a dispute between the pope and that prince, an opportunity offered of preaching against all such practices. The discourses delivered by Huss and his friends made such an impression on the people that they openly declared against the authority of the pope. The magistrates interfered, and seized and imprisoned some of the most active, while the populace flew to arms, and were only restrained from acts of violence by a promise that their friends should receive no personal injury; the magistrates basely broke their promise, and ordered the prisoners to be privately executed; and when this was known, the people again took up arms, seized the bodies of their friends by force, and committed them to the grave as martyrs to religion.

When the council of Constance assembled in 1414, Huss, having received from the emperor a formal safe conduct, both for his journey to Constance and his return to his own country; and, it is said, being in possession of a similar protection from the pope and the council itself, he appeared before the assembly. Formal charges were presented against him, and the cardinals having withdrawn to deliberate on the mode of proceeding, came to the decision that he should be committed to prison for six months. He was sent from prison to prison, was treated with great inhumanity and cruelty, and finally condemned in his absence as guilty of heresy. The remonstrance of the emperor procured for Huss a pretended hearing before the council, but he was not permitted to enter on his defence, and after another month's imprisonment he was condemned to the flames. On the same day he was formally degraded from his clerical office, and being delivered to the secular power, was hurried to the stake, and suffered the dreadful punishment with the utmost magnanimity and resignation. The numerous works of Huss were collected and published at Nuremberg in 1558, in two volumes folio.

A similar fate awaited Jerome of Prague, the pupil and zealous friend of John Huss. Although he was at first intimidated and brought to a temporary submission, he finally recovered his firmness and fortitude; and being condemned for his heretical opinions, suffered the same punishment in May 1416.

Hutcheson.

HUTCHESON, Francis, a writer on metaphysics and moral philosophy, was a native of the north of Ireland, where his father was a dissenting minister, and was born in 1694; being destined to the same profession, he pursued his academical studies for six years at Glasgow; and when about to settle as pastor of a dissenting congregation near his native place, he accepted of an invitation to superintend a private academy in Dublin, where he soon acquired the esteem and friendship of many persons of literary distinction, and even of some who held the highest rank in the established church. In 1725 his "Enquiry into the Ideas of Beauty and Virtue" was published anonymously. But the character which it soon acquired, and the eagerness to know the author, produced an investigation which terminated in the discovery that it was a production of Mr Hutcheson. In 1728 appeared his treatise "Of the Passions," which, on account of its sentiments and language, was admired even by many whose opinions on the same subjects were at variance with those of the author.

The publications now alluded to, and the celebrity which they conferred on the author, probably paved the way to his appointment, in 1729, to the professorship of moral philosophy in the university of Glasgow. As Mr Hutchison was greatly esteemed and respected by Dr King, archbishop of Dublin, and the author of "The Origin of Evil," as well as by some other eminent prelates, it was supposed that through their influence he might have obtained lucrative preferment in the church. But it is alleged, that his private sentiments were incompatible with such views. In the discharge of his academical duties, his talents and learning, as well as the facility with which he expressed himself, soon rendered him a popular and instructive teacher, and the celebrity he thus acquired attracted numerous pupils from all quarters to attend his lectures. He died in 1747 before he had completed the 53d year of his age.

Beside the works already mentioned, Dr Hutchison was the author of a "System of Moral Philosophy," which was published by his son in 1755 in two volumes 4to. In the first part of this work the author attempts to unfold the several principles of the human mind as united in a moral constitution, and thence to trace the origin of our ideas of moral good and evil, and of moral obligation; and in the second and third parts, the particular laws of nature, or rules necessary to be observed for promoting the general good, in our intercourse with each other as members of society, are deduced. According to the author, a moral sense, implanted in our nature, is the principle which, independent of reasoning, approves or disapproves of our own actions, or of those of others; and this moral sense is held to be the very foundation of virtue. In opposition to the doctrines of Hobbes, Dr Hutcheson attempts to account for laughter in a way more honourable to human nature, which, even in its corrupt state, he maintains, is susceptible of essential improvement.

HUTCHINS, John, a topographical writer, was a native of Dorsetshire, and was born in 1698; was educated at Oxford, and having enjoyed several livings in the church died in 1773, while he was rector of Wareham. He spent many years in collecting materials for "The History and Antiquities of the county of Dorset," in two volumes folio. It was completed and put to press at the time of his death, and was published under the superintendance of Mr Gough.

HUTCHINSON, John, an English author, who held peculiar notions with regard to Scripture history, was born in 1674; and being employed in the capacity of steward to the duke of Somerset, his official duties required him to travel from place to place. This afforded him an opportunity of collecting mineral substances, which he placed in the hands of Dr Woodward for the express purpose of illustrating the account of the Deluge as it is given by Moses. But this task Dr Woodward never executed, while he refused to give up the fossils, which, along with his own collection, were presented to the university of Cambridge. Having obtained an official situation which required little attendance, Mr Hutchinson had leisure to pursue his favourite studies; and, in 1724, he published the first part of "Moses' Principia," in which he ridicules Dr Woodward's "Natural History of the Earth," and even ventures to reject the doctrine of gravitation proposed and established by Sir Isaac Newton. In 1727 the second part of the same work appeared, containing the principles of Scripture philosophy; and every year, till the time of his death, in 1737, he continued to publish a volume. His whole works were collected into twelve volumes, and published in 1748.

The peculiar doctrines of Mr Hutchinson have been distinguished by the name of Hutchinsonianism, and his few followers, some of whom were men of rank and learning in the church, were distinguished by the name of *Hutchinsonians*. He asserted that all knowledge, natural as well as theological, is contained in the Hebrew Scriptures; and in support of this notion, he had recourse to the most fanciful etymologies, and maintained that every Hebrew root has some important meaning. But although he was not deficient in abilities or learning, he seemed to be destitute of that discrimination and sound judgment which are necessary to the right direction and useful application of the best talents. He possessed also mechanical ingenuity, and completed a machine of the watch kind for finding the longitude at sea, which obtained the approbation of Sir Isaac Newton, and some others, relative to its excellence and utility. But being disappointed of receiving the Parliamentary reward, he is understood to have abandoned such pursuits. In most of his writings, a violent unaccommodating temper, and a dogmatical vindictive spirit, are too conspicuous.

HUTTON, James, the author of the Theory of the Earth which bears his name, was a native of Edinburgh, and was born in 1726, received his academical education at the same university, and it is said acquired a predilection for chemistry from a remark made by the professor of logic on the action of the acids on metallic substances. Having finished his studies, he was placed, agreeably to the wishes of his friends, as an apprentice to a writer to the signet. But the drawing up and engrossing of law deeds were so little suited to his inclination, that he relinquished in a short time all thoughts of this profession, and commenced the study of medicine, which he continued for several years at Edinburgh, Paris, and Leyden, at which latter place he obtained a medical degree.

Returning to Edinburgh in the year 1750, Dr Hutton, in conjunction with his friend Mr Davie, established a manufactory of sal-ammoniac, which was the first of the kind in Scotland, and turned out a most lucrative concern to both parties. Having succeeded to a small property in Berwickshire, he determined to make himself master of the practical details of agriculture, for the purpose of undertaking its culture under his own immediate superintendance. With this view, he made a journey into Norfolk, and resided for some time in the house of a farmer; and, in 1754, he visited Flanders, that he might observe the state of husbandry in that country. For the period of 15 years Dr Hutton continued his agricultural pursuits, and had the merit of introducing many important improvements in that part of the country, where husbandry has been brought to the highest state of perfection.

About the year 1768 his residence in Edinburgh became permanent. But, previously to this time, during his excursions in different parts of England, and particularly during a long journey through the north of Scotland, he had directed his views to mineralogy and geology,—the study of which he now prosecuted with great ardour.

The first publication of Dr Hutton's, a small pamphlet entitled "Considerations on the Nature, Quality, and Distinctions of the Nature of Coal and Culm," appeared in 1777. The object of the author was to settle a question which was then much agitated, whether the small coal of Scotland and the culm of England are the same, and whether the former being carried coastwise should be subject to the duty at that time imposed on coals? The discussion of this subject came before the Board of Customs in Scotland, and also occupied the attention of the Privy Council, and finally terminated in the total exemption of the small coal of Scotland from the payment of any duty.

Exclusive of the "Theory of the Earth," Dr Hutton was the author of several memoirs communicated to the Royal society of Edinburgh, among which may be noticed his Theory of Rain, which was published in the first volume of the Transactions, and afterwards re-appeared in "Dissertations on different Subjects in Natural Philosophy," and "On certain Natural Appearances of the Ground on the Hill of Arthur's Seat." In the last memoir he attempts to account for the phenomena that accompany what are called in common language fairy rings. In Dr Hutton's theory of rain, it is supposed that two clouds, or two portions of air being saturated with moisture when they are at different temperatures, are not susceptible of retaining the same quantity of water in the state of vapour when they come in contact with each other, or when they are mixed and reduced to the medium temperature; and hence a portion of the water is separated and falls down in the form of rain. Dr Hutton was also the author of an "Investigation of the Principles of Knowledge and the Progress of Reason from Sense to Science and Philosophy." In this voluminous work of three quarto volumes, the author endeavours to shew that matter is an assemblage of certain powers; that our notions of external substances have no resemblance to the causes by which they are produced; and therefore the world, as it is conceived by the mind, is the creation of the mind itself, influenced or acted on by unknown external causes. The last work of Dr Hutton was his Elements of Agriculture. For several years he had been subject to a very painful disorder, and, under a severe attack of the same complaint, he expired in 1797.

The name of Dr Hutton is chiefly known as the author of the Theory of the Earth, which appeared first, in an abridged view, in the Phil. Trans. and in a separate and enlarged form in 1795, in two vols. octavo. According to this theory, the earthy materials of the globe being deposited at the bottom of the ocean, are consolidated by subterraneous heat; and to the expansive power of the same agent is ascribed the elevation of the masses of rock which now occupy the highest situations on the surface of the earth. The abrasion and destruction of the same materials again commence; they are again conveyed to the bottom of the sea; and by another convulsion, produced by the expansive force of heat, they are again raised far above its surface, and constitute a new portion of dry land. In this system of alternate renovation and decay, a series of changes is in constant progress, and, as the author himself has incautiously expressed it, "no symptoms of a beginning, and no prospect of an end," are visible. Dr Hutton's own exposition of his theory is involved in no small degree of obscurity; and indeed most of his works are not free from the same fault, which some have ascribed to the attempt of writing on a subject before he had fully considered its bearings and digested it in his own mind. This obscurity, it has been alleged, threw a certain charm around the Theory of the Earth, which made superficial readers admire and approve what they were not able fully to comprehend; and it is farther alleged, that being deprived of this charm by the Illustrations of the Huttonian Theory by Mr Playfair, whatever it may have gained in being rendered more intelligible, it has lost much of its imposing effect. But of the stability and consistency of this theory doubts may be fairly entertained, when it appears that its warmest admirers and most zealous advocates have found it necessary to subject it to various modifications.

Dr Hutton's collection of minerals was presented by his heirs to his friend Dr Black, professor of chemistry; and was bequeathed by the latter to the Royal society of Edinburgh, on condition that it should be completely arranged, and always kept separate, for the purpose of illustrating the Huttonian Theory of the Earth. Whether these conditions have been fulfilled, we have had no means of ascertaining.

HUYGENS, Christian, a very eminent mathematician and natural philosopher, was a native of the Hague, and was born in 1629; early discovered a strong inclination for mathematical studies and mechanical inventions, and was encouraged in these pursuits by his father, a man of rank and consequence at the court of the Stadtholder. Being destined for the profession of the law, he pursued his studies first at the university of Leyden, and afterwards at Breda: but mathematics still occupied a great share of his attention. In 1649 he visited Denmark in the retinue of the count of Nassau; and in 1651, when in his 22d year, he appeared as an author on the subject of the squaring of the circle. This work, written in Latin, as well as others on the same and similar subjects, obtained for the author the reputation of a profound mathematician. In 1657 he published a treatise "On the Calculation of Probabilities," a subject which had then begun to excite much attention; and his mechanical skill appeared in his description of the model of a newly-invented pendulum, in a work "Concerning the Use of Time-keepers for finding the Longitude;" and in 1659 he published "An Account of the Planet Saturn."

In 1663, while on a second visit to England, Mr Huygens was admitted a member of the Royal society. The investigation of the laws of motion was proposed and recommended to those members who were disposed and qualified to undertake the task. Several of the cases announced were solved by Huygens; and six years afterwards he communicated to that learned body his first four rules concerning the collision of bodies, and accompanied with demonstrations. The method of investigation, which applied only to elastic bodies, was the same as that of the celebrated Sir Christopher Wren, who had communicated to the society a memoir on the same subject at the close of the preceding year.

While on a visit to Paris for the third time, Huygens was induced, by the offer of a liberal pension from the minister Colbert, to fix his residence in that metropolis. He was enrolled an associate of the Academy of Sciences; and for 15 years, while he remained in France, he was assiduously occupied in mathematical investigations, or in the improvement and perfection of useful machines,—of which none of the least was the application of the pendulum to regulate the motion of clocks and to render them more exact. The description of a "Level with Telescopic Sights," was published in 1680. In the following year he quitted France altogether, and retired to his native country, partly, it is said, on account of his health, which had suffered much from his intense application, but chiefly, it would appear, in consequence of the revocation of the edict of Nantes, which exposed those attached to the protestant faith to severe persecution. The remaining years of the life of this illustrious man were still devoted to scientific pursuits; and the discoveries which he made, and the solutions of important problems which he accomplished, were communicated to learned bodies, and published in their transactions. The last work on which the genius and industry of Huygens were occupied was entitled KOSMOTHEOROS; *sive de Terris Cœlestibus eorumque Ornatu Conjecturæ*, in 4to, concerning a plurality of worlds, and the probability of the planets being inhabited. While this treatise was in the press, the learned author died, in 1695; and the publication of the work itself was delayed till the year 1698.

Huygens is well entitled to be placed in the first rank of the geometricians of his age, while he is justly to be regarded as one of the most distinguished astronomers that has yet appeared. The cheerfulness of his temper, the mildness of his manners, and the excellence of his private character, secured to him the respect and esteem of all who knew him; and the solitude and retirement in which he indulged for the prosecution of his studies, produced no moroseness or severity of expression in his habits and intercourse with society. His unpublished mathematical writings were bequeathed to the university of Leyden, with a request that such of them as should be deemed worthy of publication, in the opinion of certain persons nominated by the author, should be presented to the world. Under these conditions *Opuscula Posthuma*, "Posthumous Works," appeared in 1703, containing Dioptrics, the Art of polishing Glasses for Telescopes, a Dissertation on Parhelia, a Treatise on Motion, and a Description of a Planetarium. Next year *Opera varia*, including his memoirs formerly published in a separate form, were edited under the superintendence of 's Gravesande; and in 1728 the same editor published a new collection of the author's pieces in two volumes 4to, the second of which contains his posthumous works which appeared in 1703, with corrections and additions. The first volume includes the Treatises on Light and Gravity.

HUYSUM, JOHN VAN, a celebrated Dutch painter of flowers, fruit, and landscapes, was born at Amsterdam in 1682, and died in 1749. His flower and fruit pieces were so exquisitely finished, that they brought the most extravagant prices; and in the composition and colouring of landscapes he also acquired considerable reputation.

HYACINTHUS, HYACINTH, a genus of plants belonging to the Hexandria class. See BOTANY.

HYADES, the constellation of the seven stars in the head of the Bull. The name is derived from the Greek word which signifies *to rain*, because this constellation has been supposed to presage rain; and the origin of the name is traced to ancient mythology.

HYBERNACULUM, signifying *winter-quarters*, is a term employed by Linnæus to denote that part of a plant in which the embryo leaves and flowers are wrapped up and protected from the cold of winter.

HYBERNATION is that state in which plants or animals exist during the winter season, when they are deprived of the usual supplies of food. During hybernation some animals become torpid, when the activity of the vital functions is greatly diminished, and the animal functions are nearly in a state of cessation. This is the case with the bat, hedge-hog, and several species of mice, as well as with the reptiles and insects of cold climates. Many of the feathered tribes retire to warmer regions of the earth; of this the swallow and the cuckoo furnish examples; and, without changing the place of their abode, some birds acquire a thicker covering of plumage, and some quadrupeds are furuished with a closer and finer fur, to enable them to resist the severity of the season.

HYDATIDS, are small transparent vesicles filled with a watery fluid, which are either found solitary or in clusters upon the liver or in the cavities of animals.

HYDE, EDWARD, EARL of CLARENDON, an illustrious statesman and English historian, was the son of a private gentleman in Devonshire, and was born in 1608; and having spent a single year at the university of Oxford, he entered himself in the Temple in his 17th year, for the purpose of studying the law as a profession. In these studies he was under the protection of an uncle, who was afterwards raised to the rank of chief-justice of the king's bench. In his 21st year he married, but he had the misfortune to lose his wife within the short period of six months; and three years afterwards he formed a similar connection with the daughter of Sir Thomas Aylesbury, with whom he lived happily for 36 years. Mr Hyde was early introduced to persons the most eminent for learning and talents, most of whom are respectably noticed in his memoirs; and to their conversation he ascribes his literary acquisitions.

Being engaged in his professional capacity on the part of the London merchants, he attracted the notice of archbishop Laud, who was then a commissioner of the treasury, and who not only treated him with much regard, but was zealous in promoting his advancement as a lawyer. Mr Hyde being possessed of an easy fortune, was not so devoted to legal pursuits as to neglect polite literature; and in his mode of life, and the company with whom he associated, he affected the character of the gentleman rather than that of the mere barrister.

In 1640 he obtained a seat in parliament; and as public grievances were the topic of discussion, Mr Hyde brought forward a complaint of the illegal practices of the Earl-marshal's court, and in the following parliament he succeeded in procuring its suppression. Devoting himself to public business, and assuming an independent part in the measures that were canvassed, he became a leading person in many important matters. He opposed the court in the affair of ship-money; but his attachment to monarchy and to the established church was so conspicuous, that the king, in a private conference, expressed his acknowledgments for his services; and from this time he may be considered as one of the royal party. The king's Answer, with the advice of his council, to the Remonstrance of the Commons on the state of the nation, was drawn up by Mr Hyde; but, as he affectedly says, "only for the purpose of expressing his own indignation, and not to be made public." Soon after this time he declined the place of solicitor-general, but was appointed a commissioner in a private consultation on the king's affairs. In 1642 he attended the king at York, and gave his assistance in drawing up many papers in the royal cause.

When the court removed to Oxford on the commencement of the civil war, Mr Hyde was appointed chancellor of the Exchequer, and knighted. He continued with the king till 1644, when he accompanied prince Charles into the west, and afterwards to the island of Jersey, where he remained two years in the tranquil prosecution of his studies, and occupied in the composition of a history of the transactions in which he had already borne a part. In 1648 he joined the prince at theHague, and on the arrival of the news of the king's death, it was resolved to despatch an embassy to Spain, and Sir Edward Hyde and Lord Cottington being appointed embassadors, arrived at Madrid towards the close of 1649. On his return from this embassy, he found great dissensions prevailing in the king's court at the Hague; and perceiving that his attendance was no ways beneficial, he requested and obtained leave to withdraw to Antwerp, that he might live with his family in studious retirement. He was invited to Breda by the princess of Orange, the eldest daughter of the late king; and, to induce him to remove to that city, he was assigned a house free of rent; the princess appointed his daughter one of her maids of honour, and this incident he regards as having some marks of divine providence in it. In 1657 he was elevated to the nominal rank of lord high chancellor of England; and in this rank, as first and confidential minister of the king at the restoration, his wisdom, prudence, and integrity in the management of public and private affairs, have been highly extolled. New honours flowed upon him; in 1660 he was created a peer and elected chancellor of the university of Oxford; in 1661 he was advanced to the title of Earl of Clarendon; and, to support his dignity, he received various grants from the crown. But his elevation was not free from many disquiets. The jealousy of less fortunate rivals, and his rigid morals and unyielding principles, so little compatible with a licentious court, excited a great degree of hostility.

The marriage of his daughter with the duke of York, forms an important era in the history of his family. This marriage was for some time kept secret, and when it came to the ears of the chancellor, his extravagant conduct, if it did not proceed from affectation, is justly charged with the violation of decency and humanity, when he declared before the council, "that he had much rather his daughter should be the duke's mistress than his wife," and proposed that the king should commit her to the Tower, and that an act of Parliament should be immediately passed for putting her to death. He says, that he looked upon himself as a ruined person, and dreaded the king's indignation to fall upon him, as the contriver of that indignity to the crown. All this, it is alleged, proceeded from his high notions of royalty; but, while the duke basely denied the marriage, the justice and propriety of the king are entitled to admiration; the marriage was at length declared valid, and from this marriage sprung two queens of England, Mary, who was at first princess of Orange, and succeeded to the crown on the abdication of her father, and queen Anne.

Whatever influence the chancellor obtained with the crown from this alliance, his popularity with the nation was not increased, and he fell at last even under the displeasure of the king. The sale of Dunkirk to the French was regarded as highly dishonourable. He opposed a bill for liberty of conscience, seemed to encourage the persecution of non-conformists, and incurred the hatred of the king by refusing indulgences to the Papists; and the bad success of the Dutch war, although he had opposed it, was one of the charges brought against him. In 1667 he was required to resign the great seal, deprived of all his offices, impeached in the house of commons, and, during the debates, was ordered by the king to withdraw from the kingdom. A bill of banishment was passed against him as a fugitive from justice, and, when he was proceeding from Calais to Rouen in France, an order from the French court required him instantly to quit its territories. His indisposition at the time prevented him from obeying the order, and permission was at last obtained for his residence in that country. But such was the popular indignation against him, that he was attacked and wounded by some English seamen at Evreux, on pretence of being the cause of defrauding them of their pay. He lived four years at Montpellier, and finally removed to Rouen, where he died, in 1674.

Beside some political and religious treatises, Lord Clarendon is chiefly known in a literary capacity, as the author of "The History of the Grand Rebellion," in three volumes folio, or in six volumes 8vo, to which was added his life, and a continuation of his History, in two vols. 8vo, published in 1759 by the university of Oxford. Although attached to one party, and assuming as principles the justice of that side, his representations are regarded as fair and moderate; his composition is not destitute of beauty; his peculiar excellence lies in the delineation of character; and in the truth and animation of the portraits which he has drawn, he has been rarely exceeded.

HYDE, Thomas, an English divine and profound Oriental scholar, was a native of Shropshire, was born in 1636, and while under the tuition of his father, who was a clergyman, discovered a strong bias to the study of those languages in which he afterwards so eminently excelled. In his sixteenth year he was entered of King's college Cambridge; and in two years afterwards he had made such proficiency in the eastern languages, that he was invited to assist in the preparation of the Polyglot bible, and rendered very essential service to those who were engaged in that arduous undertaking. In 1658 he was admitted of Queen's college, Oxford, soon after appointed Hebrew reader in that society; and under the authority of Richard Cromwell. the son of the protector, and chancellor of the university, in consideration of his extraordinary abilities and learning in the oriental languages, was promoted to the literary distinction of master of arts.

The place of under-keeper of the Bodleian library, conferred upon Mr Hyde soon after the restoration of Charles II., and his election to the office of head-keeper in 1665, afforded him peculiar advantages in the prosecution of his favourite studies; and he did not fail to avail himself of these advantages. About this time he published a Latin translation from the Persic of Ulugh Beig's Observations on the Latitudes and Longitudes of the Fixed Stars. In 1666 he was promoted to a prebend in the cathedral church of Salisbury; and in the succeeding year he published a translation of the Four Gospels and the Acts of the Apostles, in the Malay tongue, which was printed at the expence of Mr Boyle. He drew up a catalogue of the Bodleian library, was admitted doctor of divinity, promoted to the archdeaconry of Gloucester, and in 1697 appointed Hebrew professor and canon of Christ church, while he continued to pursue with unremitting industry his researches in every department of oriental literature. In 1700 his "Religion of the Ancient Persians" appeared, and raised the reputation of the author still higher, on account of the profound erudition which it displayed in his inquiries relative to the history, learning, and theology of eastern nations.

In the discharge of his official duties as interpreter and secretary in the oriental languages during the reigns of Charles II. James II. and William III. Dr Hyde had excellent opportunities of being intimately acquainted with the policy, ceremonies, and customs of eastern nations. He died in 1702; and ranking with Bochart and Pococke, he is allowed to have been one of the greatest orientalists that any age or nation ever produced. Beside his published works, he left behind him numerous manuscripts on kindred subjects, a list of which will be found in *Biog. Britan.* or in *Aikin's General Biography.*

HYDERABAD, a province of the Deccan in India, and also the capital of the same province, which latter is 900 miles distant from Calcutta, and nearly 400 miles from Madras. See HINDOSTAN, p. 234.

HYDRANGEA, a genus of plants belonging to the Decandria class, one species of which is now familiar as a hardy ornament of the greenhouse and parlour.

HYDRASTIS, YELLOW ROOT, a genus of plants belonging to the Polyandria class.

HYDRARGYRUM, QUICKSILVER or MERCURY, is so denominated because it resembles silver in colour, and at the ordinary temperature of the atmosphere is always in the liquid state.

HYDRAULICS is that science which treats of the motion of fluids, and the construction of machines, which are employed for the purpose of conveying liquids. See MECHANICS.

HYDROCEPHALUS, water in the head, a disease which, as the name indicates, depends on a collection of water in the cavities of the brain, when it is called *internal,* and when it is on the outside of the cranium it is termed *external.* See MEDICINE.

HYDROCHARIS, FROG-BIT, a genus of plants belonging to the Dioecia class.

HYDROCOTOLE, WATER NAVELWORT, a genus of plants belonging to the Pentandria class.

HYDRODYNAMICS, a name derived from the Greek, and denoting "power of water," includes under it both Hydrostatics and Hydraulics, the first relating to the doctrine of the pressure of water, and the second to its motion. See MECHANICS.

HYDROGRAPHY, from the Greek, and signifying a "description of water," is that department of natural history which gives an account of seas, lakes, springs, and rivers. See GEOLOGY.

HYDROMEL, a mixture of honey and water, nearly in equal proportions; and when it has undergone fermentation it is called vinous hydromel or mead, a peculiar kind of wine, which was not uncommon in this country in former times.

HYDROMETER, an instrument for ascertaining the density or specific gravity of liquids, and particularly of importance for the purposes both of trade and revenue in determining the strength of spiritous liquors. See MECHANICS.

HYDROPHYLLUM, WATER-LEAF, a genus of plants belonging to the Pentandria class.

HYDROSTATICS is that branch of physics which treats of the weight, pressure, and equilibrium of liquids. See MECHANICS.

HYGROMETER, from the Greek, and signifying "measurer of moisture," is an instrument for observing the degrees of moisture or dryness in the air of the atmosphere. See METEOROLOGY.

HYMENÆA, BASTARD LOCUST TREE, a genus of plants belonging to the Decandria class.

HYMENOPTERA, is one of the orders into which the class of insects is divided according to the Linnæan arrangement. See ENTOMOLOGY.

HYOBANCHE, a genus of plants belonging to the Didynamia class.

HYOSCYAMUS HENBANE, a genus of plants belonging to the Pentandria class, one species of which Hyoscyamus Niger is a native of this country, and is a poisonous plant.

HYOSERIS, YELLOW EYE, a genus of plants belonging to the Syngenesia class.

HYPATIA, a lady celebrated for her mathematical learning, was the daughter of Theon, president of the Alexandrian school, was born about the close of the fourth century, and with the instruction of her father, who was also a distinguished mathematician, made so much proficiency in geometry and astronomy, that she became one of the most learned persons of the age, was raised to the rank of a public teacher, and was attended by a crowded audience. In consequence of some suspicion that she was attached to the ceremonies of paganism, or of a popular disturbance which it is alleged was excited against the Roman governor of Alexandria at the instigation of Cyril, the bishop or patriarch, a body of monks dragged her from her chair, and barbarously put her to death in the year 415.

HYPECOUM, WILD CUMIN, a genus of plants belonging to the Tetrandria class.

HYPERBOLA, a curve which is formed by cutting a cone in a direction parallel to its axis. See MATHEMATICS.

HYPERBOLE, a figure in rhetoric, by which the truth and reality of things are either magnified or diminished, as in the following example:

> Draw them to Tyber's bank; and weep your tears
> Into the channel; till the lowest stream
> Do kiss the most exalted shore of all.
> *Julius Cæsar.*

HYPERICUM, ST JOHN'S WORT, a genus of plants belonging to the Polyadelphia class, and of which several species are natives of Britain.

HYPNUM, FEATHER MOSS, a genus of plants belonging to the Cryptogamia class.

HYPOCHÆRIS, HAWK'S-EYE, a genus of plants belonging to the Syngenesia class.

HYPOCHONDRIASIS, or HYPOCHONDRIAC PASSION, a nervous affection, which is accompanied with some degree of mental alienation. See MEDICINE.

HYPOSTASIS, a word derived from the Greek, and literally signifying substance or subsistence, seems to have been employed in theology as synonymous with *person*, and occasioned great dissension in the ancient church concerning its proper application to the persons of the Godhead.

HYPOTHEC, a law term, denoting an obligation either formally entered into or tacitly understood, by which the effects of a debtor are assigned to his creditor for the purpose of securing his debt. The furniture of a house, or the produce of the soil, is considered a legal or tacit hypothec for the payment of rent.

HYPOTHESIS is a term employed in philosophy to denote a proposition or principle, the truth of which is assumed or taken for granted, for the purpose of explaining any series of facts or appearances. When the greater number of appearances is susceptible of explanation by the principle assumed, the term *theory* is then employed. Thus, upon the principle of universal gravitation, all the appearances in the revolutions of the heavenly bodies are satisfactorily elucidated, and hence the doctrine of gravitation proposed by Sir Isaac Newton is called a theory. By the assumption of the existence of a peculiar fluid, electrical appearances are explained; and, according to one set of philosophers, these appearances are accounted for by supposing different bodies to be possessed of different proportions of the same fluid, while others admit the existence of two fluids; and hence arise two theories of electricity.

HYPOXIS, BASE STAR FLOWER, a genus of plants belonging to the Hexandria class.

HYSSOPUS, HYSSOP, a genus of plants belonging to the Didynamia class.

HYSTRIX, the PORCUPINE, a genus of quadrupeds belonging to the order of *Glires*. See MAMMALIA.

HYTHE, is a town of Kent in England, and one of the Cinque-ports, and contains more than 2000 inhabitants.

I.

I is the ninth letter, and the third vowel of the English alphabet, and is pronounced by a sudden projection of the breath against the palate, as it issues from the larynx, with a slight hollowing of the tongue, and nearly the same opening of the lips as in sounding the letters *a*, or *e*. In some words the sound is long, as in *high*, in others it is short, as in *bid*; in some it is pronounced like *y*, as in *onion*, and in a few it is sounded lik *ee*, as in *machine*.

The same letter is used as a consonant when it has the soft sound of *g*, and in modern printing the form is different, as in *jack*, *James*.

As a numeral, this letter was employed by the Romans to signify *one*; when added to other numerals, it denoted that so many units are added, as V *five*, VI *six*, VII *seven*; but when prefixed to a number, it denotes the subtraction of one, as IV *four*, IX *nine*. Among the ancient Romans, IↃ denoted 500, CIↃ 1000, IↃↃ 5000, CCIↃↃ 10,000.

JACK, a machine employed for raising great weights, either by means of levers or a combination of wheels; and also a well-known machine, the common kitchen or roasting-jack, the moving power of which is a weight, and the uniform motion is produced by means of a fly-wheel.

JACKSON, PORT, the principal town and the seat of government of the colony of New Holland, or New South Wales. See HOLLAND, NEW.

JACQUINIA, a genus of plants belonging to the Hexandria class.

JADE, or NEPHRITE, or AXE-STONE, a mineral substance belonging to the Magnesian genus. See GEOLOGY.

JAEN, a town of Andalusia in Spain, is defended by walls and towers, has a magnificent cathedral and several other public buildings, and contains a population equal to about 30,000. The silk manufacture, which was once in a very flourishing condition, has declined of late years.

JAFFA, a sea-port town of Palestine, stands on the declivity of a hill on the eastern shore of the Mediterranean, and is 40 miles to the southward of Acre. The town is surrounded with walls, and many of the houses are well built. The population is estimated at 7000. Soap is said to be the principal manufacture, and the town is supported by its commerce, and also derives some advantage from the pilgrims in their passage to the holy land. The harbour is capable of admitting vessels only of small burden. Jaffa is celebrated as the Joppa of sacred scripture; and it has become still more memorable on account of the assault which it sustained from the French in 1799, and the indiscriminate massacre of the inhabitants of every rank and age which followed when the place was taken by storm.

JAGGERNAUT, or JUGGERNAUTH, the most celebrated of the religious establishments of the Hindoos, is situated in the province of Orissa, in the Deccan, and is usually visited by more than a million of pilgrims, who pay their devotions to the idol of the same name. See HINDOSTAN.

JAGHIRE is a term employed in Indian affairs, and signifies an assignment of the revenue of any particular district to an individual, on condition of defraying the civil or military charges of the district. The person to whom this assignment is made is denominated jaghiredar, and the lands thus disposed of are said to be held in jaghire.

JAGO, ST, the name of several towns in different parts of America, as St Jago de Cuba, a town on the southern coast of the island of Cuba, situated on a river of the same name, and having a good harbour; St Jago de la Vega, or Spanish town, the capital of the island of Jamaica; and St Jago, the largest of the Cape Verd islands on the coast of Africa, which produces sugar, cotton, and most of the tropical fruits. But in 1792, according to Sir George Staunton's description, it had suffered so much from severe drought, that the rivers were dried up, the soil was destitute of herbage, and absolute famine prevailed.

JALAP, the root of a species of convolvulus or bind-weed, which is employed in medicine. See MEDICINE.

JAMAICA, an island of the West Indies, and the largest and most valuable of the British colonies in that quarter of the globe, lies between the 18th and 19th degrees of north latitude, and 76° and 78½° of west longitude. In extent of surface Jamaica comes next to Cuba, which lies to the northward, and Hispaniola, situated to the eastward. The bay of Honduras, and the Spanish Main, are on the west and south. The length of this island is estimated at 140 or 150 miles, and its greatest breadth about 50 miles. Jamaica was discovered by Columbus, in his second voyage in 1494; it was settled in 1509; and, after being in the possession of the Spaniards for 160 years, it was taken by the English in 1654, during the protectorate of Cromwell, and has ever since continued subject to Great Britain.

Aspect and Climate.—The island of Jamaica, which approaches somewhat to an oval form, is divided, nearly throughout its whole length, by a lofty chain called the Blue mountains, the highest summit of which rises 7531 feet, or nearly a mile and a half above the level of the sea. This great inequality of surface produces a remarkable diversity of climate, and no less a difference in the kinds and luxuriance of the vegetable productions. While the low grounds are covered with the richest crops or with lofty forests, the higher regions are either destitute of plants, or exhibit only a stinted vegetation. The difference of climate on the north and south sides of Jamaica is strikingly exemplified in the sugar crop coming to maturity at least six months earlier in the districts on the south side, although in some cases not more than 30 miles distant.

The average temperature, as it is indicated by the thermometer, is about 80° Fahrenheit at Kingston, but, during the sultry season, it sometimes rises above 100°; at 12 miles from Kingston the range of the thermometer is from 55° to 65°, while the sun is in the northern tropic; and on Blue Mountain peak, the summit of the ridge, the greatest elevation of the thermometer scarcely reaches 40° at noon. The rainy season, and the period of its duration, are very different in different districts of the island, but in general it is shorter and more regular on the south side.

Rivers, &c.—The rivers of Jamaica, which are very numerous, are chiefly to be considered as mountain torrents, and many of them in the time of drought are entirely dried up, while during the rainy season they are impassable. The Black river alone, on the south side of the island, which has its course through a flat country, is navigable for boats of a small draught of water. The salt marshes on some parts of the coast are of considerable extent; but the nature of the surface, and the rapid evaporation, prevent any collection of water in the form of lakes. Some mineral springs have been discovered; and a warm spring of a sulphureous quality, the temperature of which exceeds 120° of Fahrenheit, has its source near the village of Bath in the parish of St Thomas in the East, and is frequently resorted to by invalids for drinking and bathing.

Natural History.—In many places the prevailing rocks of Jamaica consist of chalk or limestone, containing animal remains, and so soft when it is first dug out as to be easily brought into shape for building by means of the hatchet. Few metallic ores have been discovered, although it is said that mines of copper and silver were wrought by the Spaniards. Some indications of lead-ore have been observed; and magnetic iron-ore in an arenaceous form is sometimes collected at the mouths of the mountain streams.

The soil and climate of this island are extremely favourable to the productions of the vegetable kingdom. In no part of the world do flowers, fruits, and forest-trees shoot up in greater variety and profusion. The mahogany tree is now rarely met with, although it is erroneously asserted, in some late descriptions of Jamaica, that the precipices are clothed with vast forests of mahogany. But many excellent woods, which furnish materials for joinery and cabinet-work, or of which some parts are usefully employed in medicine or the arts, are abundant.

The insect tribes, many of which exhibit the most splendid colours, swarm in countless myriads in the waters, the earth, and the air. Reptiles, as lizards and guanas, are very numerous in the woods and pastures, and the alligator is sometimes seen in the rivers and salt marshes. Of the serpent tribes, the black and the yellow snake are the most common. The latter sometimes grows to a large size, and commits great depredations in the poultry-yard. But no serpent of a venomous character has yet been discovered in Jamaica. In some districts land-crabs are very numerous, and furnish a delicious luxury to the inhabitants. The feathered race is not more remarkable for its numbers and variety than for the beauty and splendour of its plumage. The surrounding seas abound with excellent fish; and the turtle is occasionally caught on the sandy shores, where it deposits its eggs to be hatched by the heat of the sun. Beside the rat kind, the racoon is the only quadruped which is a native of Jamaica not in a domestic state.

Population, &c.—Jamaica is divided into three counties; Surrey on the east, Middlesex, including the central districts, and Cornwall on the west; and these counties are again subdivided into twenty parishes. According to the returns made to Parliament in 1812, the number of slaves, of which the bulk of the population is composed, exceeded 319,000. The white inhabitants probably amount to 40,000; and the free persons of colour to about 15,000. But as the returns for all the parishes had not been made, these numbers are not to be regarded as perfectly correct. The cure of each parish is served by a rector, whose salary is equal to about L.420 a-year, beside the usual fees. Jamaica is understood to be included in the diocese of the bishop of London. The administration and legislative constitution of Jamaica are under a governor appointed by the crown, a privy council composed of twelve members, and a house of assembly consisting of 43 members chosen by the freeholders. The revenue amounts to L.300,000 currency, and is chiefly raised by a tax on slaves, stock, rents, and wheel-carriages.

Agriculture.—Of the cultivated productions of this island, sugar is the staple commodity. This valuable plant was introduced soon after the middle of the 17th century; about the commencement of the 18th century the quantity exported amounted to 11,000 hogsheads; but in 1802 it had increased to 140,000 hogsheads. Rum forms one of the valuable exports of this island; coffee is extensively cultivated; the production of cotton and ginger is more limited than formerly, and indigo is almost neglected. The plantations of pimento trees, or Jamaica pepper, on the north side of the island, sometimes yield valuable crops; but the cocoa plantations, which were at one time numerous, are now almost unknown. The plantain and banana are extensively cultivated on account of their fruit, which is employed as a substitute for bread; and for the same purpose the bread-fruit tree of the South Sea islands finds a place. The principal grains are maize and Guinea corn; and many excellent roots, as the yam, the coco, sweet potato, and cassada, are raised. Beside the fruits which are common in tropical regions, the mango and the cinnamon tree have been introduced from the east, and seem to thrive luxuriantly.

The chief trade of Jamaica is confined to the mother country and to the northern provinces of America, from which provisions and lumber are imported in return for the productions of the island.

Towns.—The chief town of Jamaica is St Iago de la Vega, or Spanish town, which is the seat of government, and of the supreme courts. It is about six miles from the sea, and, including negroes and free people of colour, contains about 5000 inhabitants. Spanish town, as the name indicates, was founded by the Spaniards.

Kingston dates its foundation in the year 1693, soon after the destruction of Port-Royal by an earthquake. It is situated on the north side of a fine bay, and extends with a gentle ascent about a mile from south to north. The length from east to west is about two miles. It is built on a regular plan, has spacious streets, and many elegant houses; is a place of great trade, and contains more than 8000 white inhabitants, between 3000 and 4000 free people of colour, and about 18,000 slaves. The store-houses of the merchants are filled with the produce of the manufactures of Britain, and the markets are abundantly supplied with all kinds of butcher meat, poultry, fish, kitchen stuffs, and fruits.

Port-Royal, at one time the chief town of the West India islands, is now reduced to about 200 houses, beside the establishment of the royal navy yard, for refitting king's ships, the naval hospital, and the barracks. This ill-fated town was visited by a dreadful earthquake, which shook the island to its centre on the morning of the 7th of June 1692. In the space of two minutes nine-tenths of the town sunk under the water, and 2000 persons were swallowed up. In the beginning of 1704, the remaining houses, and such as had been rebuilt, were reduced to ashes by a destructive fire.

Morant Bay and *Port Morant*, are small villages near shipping places of the same name, from which a great deal of produce is exported. In the parish of St Thomas in the East, the village of *Bath* has risen in the vicinity of the hot springs already noticed, and at the same place a botanic garden has been established, and supported at the expence of the public.

Titchfield.—The town of Titchfield stands on a projecting piece of land, which forms the side of the harbour of Port Antonio, one of the safest and most commodious in the island. *Martha-Brae* and *Montego bay*, are towns on the north side, which have a very considerable trade, and contain each about 600 inhabitants. *Savannah La Mar*, on the south, and towards the west end, was formerly a considerable town, but suffered greatly by an earthquake and inundation of the sea in 1780.

Maroons.—When Jamaica fell into the hands of the English, some of the negroes belonging to the Spaniards retired to the mountainous districts, and, being occasionally joined by run-away slaves from the different plantations, became at length a formidable body; and in their incursions into the low-lands frequently committed great depredations. From their mode of life, they were called Maroons or Hog-hunters. A severe warfare was long carried on for the purpose of exterminating these free-booters; and finally, in 1739, a treaty was entered into between the government and the Maroons, by which they were permitted to retain their establishments in the mountains, and enjoying certain privileges were to perform in return military services in case of the invasion of the island by an enemy, and more particularly in apprehending run-away slaves. In the performance of the latter service it was often found that their fidelity was little to be trusted; and in a country and climate where the necessaries of life are easily obtained, they became a lazy, indolent race. In 1795, when the revolutionary principles of France reached the colonies, the Maroons of some of the towns discovered symptoms of discontent, and at last appeared in open rebellion. Very active measures were adopted by lord Balcarras, the governor, for the purpose of reducing them to subjection. But after some severe service of the militia and regular troops, it was attended with no successful result, till bloodhounds were procured from Cuba, which, although they were never employed, had the effect of bringing them to unconditional submission. A treaty was agreed upon, by which they were to surrender on a particular day. They were transported to Halifax in Nova Scotia; but the climate proving unfavourable, they were afterwards conveyed to Sierra Leone on the coast of Africa.—Long's *History of Jamaica*, Edward's *History of the West Indies*, Dallas' *History of the Maroon war*, and Renny's *History of Jamaica*.

JAMES, Robert, an English physician, and the inventor of the fever powder which bears his name, was a native of Staffordshire, and was born in 1703, studied at Oxford, and practised medicine at Sheffield and some other provincial towns, and finally settled in London, where he died in 1776. He was the author of a Medical Dictionary, published in 1743; of a Treatise on the Practice of Physic, and a Dissertation on Fevers, with a Vindication of the Fever Powder, and some other works. James's powder, which is a compound of oxide of antimony with phosphate of lime, has been long successfully employed as a diaphoretic in fevers.

JAMESON, George, a celebrated Scottish painter, and, on account of his eminence, styled the Scottish Vandyke, was born in 1586, and died at Edinburgh in 1644. See Design.

JAN SEILAN, or Junk Ceylon, an island in the bay of Bengal, and near the western side of the peninsula of Malacca, from which it is separated by a narrow sandy isthmus, not more than a mile in length. The island is more than 40 miles long, contains some extensive plains, which are well cultivated, and produce abundant crops of rice. The fruits of tropical regions are plentiful, and the number of inhabitants is estimated at 12,000. Tin is mentioned as one of the mineral products of the island, and the annual exportation of that metal is considerable. This island was long subject to the Siamese, but it was annexed by conquest to the Birman empire in the year 1810.

JANEIRO, or Rio de Janeiro, a province and city of Brazil in South America, and now the capital of the Portuguese government and the residence of the court. See Brazil.

JANIZARIES, an order of infantry in the Turkish army, and considered as the foot guards of the grand signior. The name is derived from a Turkish word signifying a *new band*, and it has been retained from the time of their first institution soon after the middle of the 14th century.

JANSENISTS, a sect of Roman Catholics who followed the opinions of Jansenius, bishop of Ypres, relative to the doctrines of grace and predestination. These opinions excited a great deal of controversy about the middle of the 17th century, and were finally condemned by two successive popes.

JANUARY, the first month of the year, is derived from Janus, a deity among the Romans, who was represented with two faces, one of which looked towards the new year and the other towards the old year. But, according to another etymology, the word is derived from *Janua*, a gate, because the first month may be regarded as the entrance or gate of the year.

JANUS, according to the heathen mythology, was the first king of Italy, and received Saturn into his dominions after he was driven from Arcadia by Jupiter. It is said he improved the habits of his subjects, and taught them many useful arts. Janus was represented with two faces, either as a symbol of his prudence, or that he sees at once the past and future time; and he held a sceptre in his right hand, and a key in his left, expressive of his extensive authority, and of his invention of locks. A temple at Rome was dedicated to this divinity, and the gates were always kept open in the time of war, and shut in the time of peace.

JAPAN, an empire in the eastern extremity of Asia, consisting of a groupe of islands; the principal of which are Niphon, Kiu-Siu, and Sikoff, lying between 31° and 41° N. Lat. and 129° and 142° E. Long.

Aspect, climate, &c.—The coast of these islands is rocky and precipitous; and the interior is diversified by hills and mountains with their intervening valleys. Some of the loftiest peaks are covered with perpetual snow; some of them are the seats of volcanoes; and destructive earthquakes are occasionally felt throughout the empire. The irregular surface of the country produces a considerable diversity of temperature. In the northern provinces the temperature is as low as the freezing point; and in some of the southern districts the thermometer ranges between 98 and 85 degrees. The streams, as in all mountainous regions, are numerous, but none of them has any great length of course. Lakes are also found in some situations of the country, and that of Oitz is said to be fifty miles in length.

Productions.—Japan is rich in valuable minerals. It contains mines of gold, the working of which is under the strictest limitations; and the sand of some of the streams is richly impregnated with the same precious metal. Silver is also found, but is not so plentiful as gold. Copper is very abundant, is of a very superior quality, and forms a staple commodity for exportation. Tin is not in great quantity; iron is rather scarce; and hence hooks, nails, and other things usually formed of iron, are in Japan made of copper. Sulphur is a product of the country, as well as coal, naphtha, several sorts of precious stones; and near the shores are found pearls, shells, and corals. Among the vegetable productions of the country are the varnish, the camphor, the cypress, and the pine trees; the tea, and other peculiar plants, with all the European fruit trees, are common; turnips, carrots, melons, gourds, and cucumbers grow spontaneously; and rice, barley, wheat, and pulse are cultivated for food or for exportation.

The soil is assiduously cultivated, and manure carefully collected, as in China. The ox and the buffalo are employed in the labours of agriculture, the horse in Japan being kept for purposes of state. The sheep, the goat, the hog, and other animals common in most parts of Asia, are unknown in Japan. Hares, a species of deer, boars, and foxes are among the wild animals of the country.

Inhabitants.—Travellers have represented Japan as very populous, but have made no estimate of the number of its inhabitants. But as it is, in point of extent, equal to a tenth part of China, the number of inhabitants may be estimated between 15 and 20 millions. The army alone is said to be about half a million. In external aspect the Japanese have a near resemblance to their neighbours the Chinese. They have the same yellow complexion, the same breadth of face, the same black hair, the same small sunk oblique eyes, and the same short and thick noses; but they are withal well made, active, free, and easy in their motions. They wear long, flowing robes, of cotton or silk; the costume of both sexes being nearly the same, and not affected by the caprices of fashion. Their shoes, or rather sandals, are made of rice straw, and are thrown off on entering a house; the head too is always uncovered except on journies, when a conical straw hat is worn. The men have their heads shaven like the Chinese, but the women preserve their hair and tie it round their heads. The men wear sabres, and are expert in the use of the bow and arrow. Persons of rank have muskets, and some pieces of artillery belong to the imperial guard.

Government and laws.—As Sparta had two kings, and Rome two consuls, so Japan has two emperors —the Dairi and the Kubo, the former of whom is the ecclesiastical, and the latter the military potentate. The Dairi was originally the sole ruler; but, supplanted by the ample means of influence which the military power carries along with it, he now resides in empty show at Miaco. By his attendants he is treated as a god; he never sets his foot on the ground; every utensil and dress he has used is destroyed, lest it should be applied to some profane purpose; and his hair and nails are regarded as sacred. He enjoys the revenue of the city of Miaco, and a stipend from the Kubo; but, by the zeal and veneration of his followers, he is enabled to maintain a court in a style of imposing splendour. His brother, the Kubo, is sole civil and military ruler; and although, like the other sovereigns of Asia, he is an absolute despot, his power is yet held in check by that vested in the governors of provinces, who are hereditary, and exercise supreme authority within their own districts. But care is taken that these chiefs may not become independent. They are obliged to reside for half a year at court, and to leave hostages in their absence. The inhabitants of cities are divided into wards, and exercise among themselves a certain police jurisdiction. Punishment is inflicted with intense severity, and in such a manner as to maintain the security of the government, regardless of the rank or influence of the criminal. But, according to the rigorous nature of the laws, the innocent is involved in the punishment of the guilty; the parent is punished for the crime of the child, and the child for that of the parent; the inhabitants of a street or district are made responsible for the conduct of every person within its limits. The Japanese display a daring hardihood and perfect coolness amid their sufferings. The nobles, when condemned to death, claim only the privilege of being allowed to terminate their own life.

Religion.—The religion of Japan belongs to the widely-extended system of Budh or Fo. But the original faith, which has still a footing in the country, is called Sinto. Its professors have some lofty ideas of a supreme being, but mingled with many degrading superstitions. The spiritual emperor is the head of the Sinto sect, and has the appointment of its principal functionaries. The priests are allowed to marry, and are supported by pious foundations, or by the contributions of the faithful. The Budh system of faith is professed by the secular emperor, and is more popular than the other.

Manufactures.—In industry the Japanese are preeminent; though a great part of the country consists of rugged mountains, they have contrived to cover almost every corner of it with good crops. Their architecture is slight, owing to the frequency of earthquakes. Their houses are of wood, only one story in height, but without they are plastered with a composition which gives them the appearance of stone, and within they are covered with painted paper; mats are used both as seats and as beds. Their manufactures of silk and cotton are extensive; their porcelain is of a finer quality than even that of China; they excel in the working of metals, particularly copper and steel; and in lacquering and varnishing wood, called by us japanned work, they are altogether unrivalled. They have no shipping but fishing boats, and consequently no export trade in Japanese bottoms.

Cities.—Jeddo, the capital, is in the island of Nephor, and is said to be seven miles long and five broad. It is intersected by a river, crossed by numerous bridges. As the princes and nobles of the empire are obliged to reside a considerable part of each year in the city, it is adorned with many splendid mansions. The imperial palace is a structure of extraordinary magnificence. It is built of freestone, and adorned with a lofty tower, embellished with bended roofs, gilt dragons, and other curious and costly ornaments. The hall of a thousand mats is 600 feet long and 300 broad, and its walls are wainscotted with cedar and other precious woods, and varnished in the richest style. The city is said to contain two millions of inhabitants, and is the seat of many flourishing manufactures. Miaco, formerly the capital, and still the residence of the spiritual emperor, is the centre of all the literature and science of Japan. It is also a place of great trade, and contains a population of half a million. Osaka is called the Paris of Japan, abounding with every luxury that the empire affords, and resorted to by many of the great, as the most agreeable place for spending their fortunes; while its commerce is so extensive, that almost every house is a workshop.

European intercourse.—Japan was discovered by the Portuguese about the year 1542. Sometime afterwards they established a factory at Nangasaki, and carried on a profitable commerce with the empire. Numerous bands of missionaries now resorted to the country with the pious intention of converting the natives; at first they had considerable success; but jealousies arose which led to their extermination or expulsion, and to the adoption of a law, that, so long as the sun shone upon the earth, no Christian should be allowed to set foot in Japan. The Dutch succeeded to the trade which the Portuguese had lost; and had a factory, first on the island of Firnando, and afterwards at Nangasaki. They must submit to the most degrading humiliations, and the trade is now far less lucrative. The Russians, by forming settlements on the east coast of Asia, have lately come in contact with the Japanese; but no encouragement has been given them to expect a commercial intercourse. Thunberg's *Travels;* Krusentern's *Voyage round the World.*

JAPANNING is the art of varnishing wood, metals, leather, and some other substances, to protect the surface from the action of the air, or the colours which are employed in drawing ornamental figures. See VARNISHING.

JARGON or ZIRCON, a mineral substance, which is sometimes employed as a precious stone, is found in Ceylon, and contains a peculiar earth called jargonia or zirconia. See CHEMISTRY and GEOLOGY.

JASIONE, SHEEPS SCABIOUS, a genus of plants formerly placed in the Syngenesia class, but now arranged under the Pentandria class.

JASMINUM, JASMINE, a genus of plants belonging to the Diandria class. See BOTANY.

JASON, a celebrated character of Greece, who conducted the famous Argonautic expedition, which took place nearly a thousand years before the Christian era. See ARGONAUTS.

JASPER, a mineral substance, of which several varieties are described, some of which are susceptible of a fine polish, and are employed as seals and ornaments. See GEOLOGY.

JATROPHA, CASSADA or MANIHOT, a genus of plants belonging to the Monoecia class. See BOTANY.

JAVA, a large island, of an oblong form, in the Indian ocean, between the 6th and the 9th degree of south latitude, and the 105th and 115th degree of east longitude, is about 660 miles in length, while in some places it is not above 50 miles, and in others more than 130 miles, in breadth; the area of the island is about 50,000 square miles.

Aspect.—The whole island is traversed longitudinally by a range of mountains, which rise to the height of from five to twelve thousand feet above the level of the sea. The northern shore is low and swampy; while the southern coast consists almost entirely of a series of rocks and cliffs which rise perpendicularly to a considerable height. From the central mountain range, others of inferior elevation branch off in various directions, forming and enclosing valleys of various height and extent. The streams which descend from the mountains are very numerous, but the country is too narrow for the formation of large rivers. Yet the Joana, and the Sedani or Tangerang, deserve to be mentioned. In the mountains, the craters of volcanoes are met with, and some of them are still in a state of activity. Many parts of the island are waste or overgrown with wood; but the inhabited places are described as delightful beyond most other countries. The landscape is composed of hillocks studded with clumps of trees, traversed by mountain torrents, and cut into terraces for the purposes of cultivation. "Woods," says a late traveller, "are separated by plains of the richest green; over these are strewn the huts of the natives, surrounded by palms, contrasting with trees of green foliage. The natives, in their picturesque dresses, are every where issuing with their buffaloes from the woods, or loitering with careless indifference in the shade. The beauty of the picture could not be surpassed; and its various parts so harmonize together, that, in their adjustment, nature seemed to have been directed by the hand of design."

Climate.—Java, like other tropical countries, has its wet and its dry season. The westerly monsoon, and with it wet, and frequently boisterous weather, is expected from October to March; and the easterly winds and fair weather fill up the rest of the year. In the lowest plains, the thermometer is about 72° in the morning, and rises to 83° by noon; on the summit of one of the mountains it has been observed at 27°; so that the intermediate region must be delightfully temperate. Ice as thick as a Spanish dollar has been found; and hoar frost, called "poisonous dew," is occasionally seen on the trees in the elevated districts. As to the salubrity of the island, Sir Stamford Raffles says, "The general inference which has been drawn by professional men, from the experience which the occupation of Java by the British has afforded is, that with the exception of the town of Batavia, and some parts of the northern coast, the island of Java stands on a level, in point of salubrity, with the healthiest parts of British India, or any tropical country in the world."

Productions.—No granite has been met with in the mountains of Java; some quick-silver has been found, and occasionally a little gold. The mineralogy of the island is, however, still unexplored. The variety, beauty, and value of its vegetable productions are surprisingly great. The indigenous animals of the island are nearly the same as in Hindostan, and include of course the tiger, the rhinoceros, monkies, hares, rabbits, deer, and antelopes. Snakes, lizards, and scorpions are extremely various and numerous. Mosquitoes, spiders, ants, and fire-flies appear in innumerable swarms. The bats of Java are most hideous and ferocious animals. They hang suspended from the branches of trees in clusters with the head downward, and when forced to take wing, fly with their young clinging to their breasts. Their bodies, covered with long hair, resemble the fox in colour, smell, and form, but that of a full grown rat in size. Among the feathered tribes are white eagles, cassowarys, parrots, birds of paradise, Java sparrows, pigeons, pheasants, peacocks, jungle fowl, quails, snipes, ducks, and geese. The rivers, bays, and creeks, and indeed the whole of the coast around the island, abound in excellent fish of many different kinds; and the fisheries form a productive species of industry.

Inhabitants.—The population, as estimated by a census made in 1815, is upwards of four millions and a half. The natives have a brown complexion,—a robust frame,—a short squat figure,—long, lank, harsh, and invariably black hair,—a round face, with high cheek bones, a wide mouth, black eyes, and flattish nose. They belong, in fact, to the Malay race, which has been so frequently described. They are temperate and even abstemious in their diet. Rice, spiceries, and a small portion of animal food, constitute their ordinary fare. Drunkenness is not common, except at their festivals. They are industrious or indolent in proportion to their civilization or barbarity; possess a high degree of fortitude, and are generally superior to the fear of death. They are slow of comprehension, have no capacity for intrigue, and have a sacred regard for truth. They are hospitable, and courteous, and though tenacious of their rights, neither litigious, avaricious, nor rapacious. As a drawback on these and their other good qualities, they are said to be revengeful and superstitious. A blow will not be tolerated; the *kris* is at hand ready to avenge the insult. As the law recognises the right of private revenge, and as a pecuniary commutation is accepted in place of the punishment awarded for murder, it is easy to infer the state of insecurity which must characterise their social intercourse. They believe in dreams, omens, charms, philtres, and relics.

The husband pays a price for his wife; and though polygamy and concubinage are tolerated, they are regarded as a vicious luxury of the great. No man will give his daughter for a second or third wife to a person of his own rank; nor are women immured, except among the upper classes. Parental authority is exercised to the latest periods of life, and filial duty willingly returned. The houses, in some situations, are raised on strong posts; are constructed chiefly of bamboo, palmeto leaf, and wild grass; and are generally grouped into villages, so that a town is merely an aggregation of villages, distinguished by the public mosque and the palace of the prince. The natives sit and eat on the ground off trays of wood or brass; and they sleep on benches of bamboo, furnished with a mat or pillow. In cooking they use hollow pans imported from China. Children go naked till the age of six or seven. The sarung, or envelope, used in the manner of the Scots Highland plaid, is a universal piece of dress, and, under it, drawers or pantaloons fastened with a zone are worn; a coat, or rather a frock with sleeves, is also generally used; the legs and feet are bare, while a slight turban is wrapt round the head; and ornaments and cosmetics are highly valued, and employed by such as can afford to use them. The *kris* or dagger, the betel box, and the umbrella, form constant appendages of the Javanese costume. The kris, clubs, bows and arrows, and fire-arms, are their weapons of war.

Government, laws, religion.—The government is pure despotism, but there are customs which the people love and which the sovereign seldom invades. But rank, liberty, property, and even life itself, depend on the will of the despot, who issues his orders through the *pateh* or vizier. Despotism descends downward from the prince to the lowest of the people, in measured gradation. There is even a dialect of the language appropriate to superiors and another to inferiors. The Mahometan religion prevails, and the laws, except old customs, are consequently derived from the Koran. The ancient religion seems to have been that of Budh, and extensive ruins of temples still exist in the island. The revenue arises from a poll-tax, taxes on land, and consumption. The impost on land is the most important.

Soil and agriculture.—The soils of the vallies are of great depth and fertility, and even those high on the mountain slopes carry good crops. Every accessible spot is covered with a rich harvest. A plough, a harrow, a hoe, a knife, and a sickle, with buffaloes or oxen, form the whole stock of implements required for the cultivation of a soil so rich under a climate so genial. Two kinds of rice are grown, the one requiring irrigation and the other on dry soil. Pulse, arrow-root, sweet potato, and many other nutritive roots and plants are cultivated, as green crops after rice; but the best soils are scourged with everlasting crops of rice. In some happy situations the husbandman is ploughing or harrowing in one compartment of a field, sowing in another, while in a third the grain is in flower, in a fourth yellow, and in a fifth reaping; and the culture may be urged so as to obtain six crops in two years and a half. Maize, millet, palms of different kinds, cotton, sugar-cane, tobacco, coffee, and pepper, are likewise objects of culture.

Manufactures and commerce.—The Javanese work well in metals, and make all kinds of utensils of iron, brass, silver, and tin. Much ornament is occasionally lavished both on the blade and the handle of the kris; betel-boxes are curiously carved; the materials of ship-building are abundant, and they have vessels from the small canoe to 50 tons burden. Their manufactures of the loom are of silk and cotton, they are of a coarse texture, and are usually dyed blue or red. The art of turning an arch is at present not understood, and indeed there is not a bridge in the island,—no sluice of durable materials,—no artificial canals,—and no tanks or other public works of irrigation. The natives are skilful imitators, and want but little instruction to make rapid progress in the ordinary arts. Trade is said to be honourable, and the higher class of dealers to be remarkable for fairness, spirit, and integrity. The women are almost the sole merchants and brokers. The markets present scenes of great bustle and activity, as all the different sorts of artisans mingle with the buyers and sellers in quest of employment. The commercial intercourse with China is considerable; and thence are imported tea, porcelain, culinary vessels, cotton cloths, raw silk, brass-ware, paper, books, paint, shoes, fans, umbrellas, and toys,—for which native produce is exported. The same articles are sent also to Arabia and Europe; and the principal of these are rice, sugar, coffee, pepper, indigo, teak-wood, and spiceries.

Towns.—Batavia, the capital of the Dutch settlements in the East, is on the north coast at the mouth of the river Jacatra. The harbour is commodious; but the city is built on swampy ground. The fort is of coral rock, and part of the wall of lava. There are canals in many of the streets, with rows of evergreen-trees. It has a handsome hospital, a well-furnished arsenal, and is an emporium for all the commodities of the east of Asia. The inhabitants are of almost all the countries of the world, and exceed the number of 200,000. The climate does not suit European constitutions; yet there are more than 5000 resident in the city, chiefly Dutch, Portuguese, and French.

Bantam, the capital of a kingdom of the same name, stands on the north-west extremity of the island. It is traversed by a river, and is full of cocoa-nut trees. The neighbouring country is productive of pepper, of which great quantities are exported by the Dutch. This town has declined from its former greatness; and the harbour is so much choked up as to be inaccessible to ships of burden. The English and the Danes had formerly factories at Bantam, but they were expelled by the Dutch in 1682.

Historical notices.—The Europeans and Mahometans first became acquainted with the Javanese toward the end of the sixteenth century, when the religion of Budh was prevalent, and the people chiefly Hindoos. The religion of the Koran was introduced by emigrants from Arabia, and soon pervaded this and the neighbouring islands. The Dutch came into Java soon afterwards, and in process of time acquired a supremacy over it, and retained their power till 1811, when, under the auspices of the late earl of Minto, governor-general of India, it became subject to Great Britain; but, in 1816, it was again delivered up to the Dutch.

IBERIS, Candy-tuft, a genus of plants belonging to the Tetrandria class.

ICE is water in a solid state, to which it is converted when the temperature is reduced below 32° Fahrenheit. It then becomes a transparent crystallized substance. As the process of freezing usually advances rapidly, the crystals are formed in a confused mass. But as they have been examined by different naturalists, they appear to be either octohedrons or regular six-sided prisms. The prismatic crystals are usually arranged at angles of 60° and 120°. See Chemistry.

ICELAND, a large island in the northern part of the Atlantic ocean, included between the 63d and 68th degrees of north latitude, and between the 12th and 26th degrees of west longitude, and about 700 miles in length from east to west, and 300 miles in breadth from north to south. This island, part of which is comprehended within the frigid zone, presents a very dreary aspect to the eye accustomed to the verdant and luxuriant vegetation of southern regions. A great extent of the surface is covered with lofty mountains, or abrupt precipices; and in some places wide plains traverse the island. Some of the mountains rise to an elevation of nearly 6000 feet above the level of the sea, and, as may be expected in such a climate, are covered with perpetual snow. The coast in most places is indented by bays and arms of the sea; but few of the harbours afford safe shelter during the storms of winter.

Rivers, &c.—Some of the rivers of Iceland are of considerable magnitude, and derive a large proportion of their waters from the melted snow; lakes are numerous, and some of them of great extent.

Climate.—The cold of Iceland is less severe than what might be indicated by its position; the thermometer sometimes sinks to zero of Fahrenheit in winter, and as high as 100° during the short summer. But the descriptions of an Icelandic winter present a most dismal picture, not so much from the severity of the cold as from the sudden and frequent alternations of mild weather and dreadful storms. Intense frosts sometimes happen in May and June; and as the herbage, the only support of the sheep and cattle, is thus destroyed, they are usually followed by destructive famine. Great cold is also sometimes produced by immense fields of ice approaching the island.

Hot springs.—The hot springs of Iceland, called the *geysers*, form a remarkable feature in the history of that country, not only on account of the temperature of the water, which is 212° before it issues from the basin, the great height to which it is projected, and the explosions with which it is accompanied, but also on account of the siliceous earth which it holds in solution and deposits on the sides of the basin and in the course of the current. A description of these springs has been already given under Geology. Beside the geysers, hot-springs are observed in other parts of the island; and in some places a great deal of black mud is thrown up.

Volcanoes.—Iceland has been known from a very early period as a volcanic country. The earliest eruption from mount Hecla, of which any memorial is preserved, happened about the commencement of the 11th century; and the whole number of eruptions since that period is stated at twenty-two, of which the last took place in 1766; but flames were seen in 1772. Hecla is not the only volcanic region of Iceland; eruptions have appeared in other parts of the island; and, including those of Hecla, the number recorded by different authors amounts to forty-two. But the most tremendous eruption that has visited Iceland in modern times proceeded in 1783 from Skaptaa Jokul, a mountain about 42 miles distant from Hecla towards the north-east. This eruption was preceded by violent earthquakes, and continued, with some interruptions, from June to August. Before the commencement of this eruption, a submarine volcano, about 30 miles distant from cape Reikianes, was in a state of activity, when several small islands were thrown up and afterwards sunk under water. In another quarter of the island, powerful streams of lava burst forth from mount Krabla between the year 1724 and 1730, part of which flowed into a lake which was almost dried up, and part laid waste a considerable tract of inhabited country.

Natural History.—The rocks of Iceland, as far as they have been examined, belong to the basaltic class. In many places they assume a regular columnar form, and contain in their cavities and fissures the minerals which are usually associated with such rocks, as zeolite and calcedony, of which Iceland has furnished the most splendid specimens to the cabinets of the mineralogist, rock crystal, and lime-spar. The finest and purest specimens of rhomboidal lime-spar, which is so much prized on account of its property of double refraction, are obtained in Iceland. Sulphur is so-abundant in some places as to form a valuable commercial commodity.

The vegetable productions of Iceland are neither numerous nor luxuriant. They have been particularly examined by some of the native botanists. The birch is the only tree that survives the rigour of the winter, but it is always of diminutive growth, and never exceeds four or five feet in height. The same species of plants, and of the same character, appear on the shores of Iceland that are found on the most elevated regions of the highest mountain of Scotland, according to the observations of Mr Hooker, who visited Iceland in 1809; thus exhibiting a corresponding climate and temperature by elevation above the level of the sea, and distance from the equator.

Of the animals of Iceland, quadrupeds are not numerous; two varieties of the fox are known, and are hunted for the sake of their skins, which constitute a valuable commercial commodity. From an original stock of three rein-deer imported from Norway in 1770, vast herds have been produced, and run wild in the mountains. The white bear, conveyed to the shores of Iceland on the floating ice, commits great depredations on the sheep. When they appear, the inhabitants assemble with what weapons they can procure, and either destroy them, and obtain a premium, which is offered by the public, or drive them back to the ice. Sheep, goats, cattle, and horses, are the principal domestic animals; some of the larger of the feathered tribes, as the eagle and falcon, are natives of Iceland. The swan, and numerous other kinds of water fowl, are frequent on the lakes, morasses, and shores, and the valuable eider-duck visits the island early in June. The nest is formed on the ground, and generally composed of a little grass, lined with the fine down from the breast of the duck. Of the four eggs which the nest usually contains, two are taken away and are eaten by the inhabitants as a great luxury. The nest is also robbed of the down, which forms a valuable article of trade.

Cod, ling, and various other kinds of fish, are abundant in the surrounding seas, and at certain seasons of the year afford occupation to the industry of the inhabitants; and they are caught not only for home consumption, but for exportation. On some parts of the coast, sharks are taken for the sake of the oil, and great shoals of herrings appear in the bays of the northern coast.

Population.—The population of Iceland in 1808, was estimated at 48,000; and it appears, that it has not varied much for a century past, for in 1703 it is stated at 50,000, and in 1770 at 46,000. But within this period a dreadful mortality prevailed, as in the year 1707, when about 16,000 persons, exceeding a fourth part of the whole population, died of the small pox. In the year 1797, 600 were carried off by the same disease; and between the year 1753 and 1759, a famine swept off 10,000 persons, with great numbers of cattle.

Government, &c.—The same code of laws, and the same form of government, have continued in Iceland, with little alteration, for the long period of nearly six centuries. The governor is appointed by the crown of Denmark, and subordinate to him are provincial officers, who collect the taxes, hold courts of law, and watch over the public peace.

For seven centuries the ecclesiastical establishment of Iceland consisted of two bishopricks, which in 1797 were united into one; under the bishop are provosts or deacons, and parish priests. The whole island is divided into 184 parishes, and the revenues of the clergy are derived partly from lands annexed to the churches, and partly from tythes upon landed property. But its whole amount forms a very scanty provision for a useful and learned body of men.

In their moral and religious character the natives of Iceland have obtained the commendation of travellers for industry and hospitality, integrity, intelligence, and strict attention to the duties of religion. Having little intercourse with the rest of the world, the same simplicity of character and dress that existed several hundred years ago probably prevails at the present day.

Rural affairs, &c.—The industry of the farmer in Iceland is confined to the rearing of sheep and cattle. The practice of letting farms from year to year is not uncommon; but leases for a term of years are rare. Rent is paid in two ways; a land-rent, which, according to an old valuation, is a certain fixed sum, and a rent for a permanent stock of sheep and cattle, which is considered to be the property of the landlord. Agriculture is unknown; and manufactures are limited to a few simple domestic arts. The fisheries may be considered as one of the principal sources of industry to almost the whole population of Iceland. For, during the fishing season, the natives of the inland districts proceed to the coast to be employed in that business.

Commerce.—The trade of Iceland has long laboured under severe restrictions; from the beginning of the 17th century to the year 1776, it was confined to a chartered company. This monopoly was a great source of oppression, and at last induced the Danish government to interfere, and provide a fund for carrying on the trade. This fund was vested in the king for ten years, and at the end of this period was intrusted to commissioners, who were empowered to lend money at four per cent. interest to those who engaged in the trade to Iceland, and for its encouragement other privileges were granted. Before the French revolutionary war, fifty vessels, from 100 to 150 tons, were employed in this trade. But in 1810 the number was reduced to seven. The exports consist of fish dried or salted, oil, tallow, wool, and woollen yarn, stockings, salted salmon, cloth, lamb skins, salted sheep skins, shark, fox, goat, and swan skins; feathers, eider down, Iceland moss, and rein-deer horns; and the imports are chiefly grain, spirits, wine, coffee, sugar, soap, salt, tobacco, iron, tar, hemp, spiceries, and a few other luxuries.

Literature.—The Icelanders have been always distinguished for their literary character. History and poetry seem to have flourished even in the earliest ages. The Icelandic *skalds*, or poets by profession, obtained a high character, not only in their own country, but throughout all the north of Europe. The principal bards that appeared in the courts of Norway, Sweden, and Denmark were natives of Iceland. The *sagas*, or historical narratives, in which fable is blended with real events, hold a conspicuous place in the early period of Icelandic literature. In some of these compositions, which are often distinguished by tenderness and beauty, the character of poets, priests, or warriors is delineated; in some a portion of history of a political or religious nature is admitted, and others are confined to a simple narrative of a family or tribe.

When the reformation of religion was introduced into Iceland, about the middle of the 16th century two schools were established. They were afterwards united into one, and removed to Reikiavik the principal town. The establishment is now transferred to Bessestad, formerly the residence of the governors of Iceland, and consists of three teachers with 24 scholars, who are chiefly destined for the priesthood, and are instructed in the ancient and modern languages, history, geography, and divinity. To this institution is attached a library, containing more than 1200 volumes, chiefly of Danish and Icelandish books; but, beside a few good editions of the classics, it includes some German, English, and French authors.

History.—The discovery of Iceland is ascribed to some pirates from Norway and Sweden about the year 860. But no settlement was made in Iceland till the year 874, when a body of noblemen from the former country, to avoid the oppressions of their sovereign, submitted to voluntary exile, and fixed themselves in the south western part of the island. Soon after, other noble families, with numerous trains of dependents, discontented at home, retired to Iceland, and spread their settlements along all the coasts of the island; the emigration continuing, in little more than half a century the population of the coasts was fully equal to the means of subsistence; and it appears from the earliest records of the country, that the spirit of emigration was not confined to the northern states of Europe, but extended itself even to Scotland and Ireland. But as the Norwegians were the most numerous class of colonists, they carried with them their religion, customs, and historical records, and finally gave the predominating character to the new settlement; a feudal arrangement was adopted, and each leader of a body of emigrants taking possession of a certain district of country, distributed to his followers under the usual conditions of vassalage. Thus separate and independent communities were established, and naturally gave rise to feuds and contests, till the whole were united in one common interest by the establishment of a new constitution under the form of an aristocracy. Three great events form remarkable eras in the history of Iceland; namely, the introduction of Christianity about the end of the 10th century; the reformation of religion, and the reception of the doctrines of Luther, about the middle of the 16th century; and the establishment of a printing press about the year 1530. The last event gave a new turn to its literary character. The printing establishment is still kept up in Iceland, and is chiefly supported by the Literary society, whose transactions, including memoirs on various subjects, afford favourable specimens of the talents and studies of the members. Some natives of Iceland have distinguished themselves by their compositions in poetry, history, civil and natural, and rural economy.

The principal town of Iceland, is Reikiavik, in the south west part of the island, and is the seat of government, and the residence of the bishop. The villages in other parts of the island are scarcely any thing else than mercantile or fishing establishments.—Von Troil's *Letters on Iceland;* Hooker's *Travels in* 1809; Sir George Mackenzie's *Travels in* 1810, and Henderson's *Travels.*

ICHNEUMON, a genus of insects belonging to the order Hymenoptera. See Entomology.

ICHTHYOCOLLA, from the Greek, signifying *fish glue,* is supposed to be analogous to isinglass, which is prepared from the sounds or air bladders of different fishes, but chiefly from those of the sturgeon.

ICHTHYOLOGY.

Introduction.

Definition.—That department of the natural history of animals which treats of fishes, has been denominated Ichthyology, from two Greek words, signifying a *discourse on fishes.* The term *fish* has been variously understood and applied, even by scientific writers. In the language of the common people, almost every animal that swims or inhabits the water is called a fish; so that, according to this loose acceptation of the word, animals of very different classes, conformation, and natures, are confounded together in one motley and discordant groupe. The majestic whale, the two-footed siren, the tadpole of the Surinam frog, the marine turtle, the diminutive shrimp, and the almost lifeless oyster, have all been designated by the name of fish. Nor are the writers on Ichthyology agreed on the general characters or definition of fishes. Some have selected one or two circumstances, as forming the characteristic of the class, which others have omitted or altered.

It is evident that no single feature is sufficient to discriminate so numerous a class as that of fishes. They are generally called the *finny race*; but if this character alone be adopted, many reptiles and mollusca must be admitted into the class, and some species must be excluded. The presence of *gills* as the organs of respiration, is considered a necessary circumstance in the definition; but by thus restricting it, the whole assemblage of cetaceous animals, which are usually called fish, and have been ranked in that class by several respectable writers, must be omitted. Lacepede defines fishes "animals with red blood, breathing by means of gills;" and for what have been called the *proper fishes* this definition is sufficient. In order to include the cetaceous animals, another circumstance must be added, and the more comprehensive definition will be as follows: *Vertebral animals, circulating red blood, and breathing by means of gills, or by lungs, with openings in the upper part of the skull for ejecting water.*

General view.—Ichthyology is one of the most extensive departments of zoology. That it is so, will not be thought surprising, by one who considers the vast extent and varied situation of the element inhabited by fishes. It is computed that two-thirds of the globe are covered with water, including, besides the great expanse of ocean, numerous rivers, lakes, brooks, pools, ponds, and ditches. In all these situations fishes are found, of a thousand magnitudes, forms, colours, and properties. The ocean exhibits the greatest numbers, and the most diversified species. *There* are seen the numerous tribes and species of whales; there congregate those immense shoals of herrings, cod, haddocks, ling, torsk, whiting, mackerel, sprats, turbot, skate, and many other species that supply the necessities and gratify the palate of so large a proportion of mankind. The rivers abound with salmon, trout, smelts, perch; the lakes and ponds with pike, carp, tench, roach, eels, and many others; and the brooks and running ditches teem with the minnow and the stickleback. The countless multitudes of these familiar species that in their seasons are daily caught, sufficiently testify the extent and utility of this department of animated nature; but if to these be added the species already discovered in the torrid zone, and in the frozen regions of the north and south, without taking into the account the different kinds which still lurk unseen in the depths of the ocean, or at the bottom of lakes or inland seas, the mind will be filled with wonder, and the imagination with astonishment. About 1500 species of fish are at present known, and of this number about 200 are found on the coast or in the inland waters of Britain.

Utility.—The advantages to be derived from the study of ichthyology are numerous, and some of them sufficiently obvious. More than 100 species are in various countries employed as food, and there can be no doubt that this number might be greatly increased. To become intimately acquainted with the forms, habits, properties, residence, and proper season of animals, which constitute so large a portion of our subsistence, is therefore not only desirable but necessary. For want of such information the ignorant and credulous purchaser is often deceived into buying fish of inferior nature or quality, for such as are more delicate or fetch a higher price; or induced to take, out of season, fish which, though then scarcely eatable, would be excellent at another period. Plaise are imposed on him for dabs or flounders, codling for haddocks, holibut or perhaps a large plaise for turbot; or he is persuaded to take a lank, long-tailed fish, without roe, in August, which in April or May would have been plump, short, and full of roe. But fishes are interesting objects, not merely as articles of food. Many of them furnish substances highly useful in domestic economy, medicine, or the arts of life. The Greenland whale supplies train-oil and whalebone; the cachalot a finer oil, spermaceti, and ambergris; the narhwal or unicorn-fish, the finest ivory; the beluga and sturgeon, isinglass; the ray and dog-fish, the fish skin for polishing wood or making shagreen; the cod, an oil that has been found an efficacious remedy in rheumatism, and is largely employed in dressing leather.

As a study of curiosity and interest, ichthyology is not inferior to any other branch of zoology; and, according to the opinion of some naturalists, is superior to most. The great diversity and often beauty of their forms, the occasional splendour and variety of their colours, the rapidity of their motions, and the remarkable instincts exhibited by some of them, render fishes a highly interesting and instructive class of animals.

Useful as the study of fishes is thus shewn to be, it must be acknowledged that few parts of zoology are more difficult. The nature and extent of the element which they inhabit prevent the observer from acquiring very distinct and accurate information respecting many circumstances, without which their natural history is incomplete. Their colours, motions, habits, and propensities, the food on which they subsist, the manner in which they pass those seasons when the cold of winter, or the change of constitution which they occasionally undergo, compel them to retire from the open water to more private and secure haunts, are, in many species, very imperfectly known. When taken from their native element, they are viewed under altered and unfavourable circumstances. Their colours have faded; their fins are collapsed; their motions have ceased or have become languid, and their appearance is often considerably changed. In that state, only their external form and anatomical structure can be successfully investigated, and of course their natural history must be little understood. Besides, the opportunities of actually examining living or recent specimens are few, and confined to the more familiar species found in a particular district. Other kinds can be observed only through the unsatisfactory medium of stuffed skins or coloured plates.

Method of study.—In studying ichthyology, the first object should be to become acquainted with the terms employed by naturalists, and to distinguish the parts of fishes or the proper nomenclature; the second, to acquire a competent knowledge of some approved system or classification, in order to understand the characters by which the several tribes and species are discriminated. After these preliminary steps, the animals themselves should, when practicable, be examined in their native waters, or as soon as possible after being removed from them. An expert angler may easily become a good ichthyologist, especially if he have an opportunity of taking a sea voyage. Several species may be conveniently studied in artificial ponds, or even in glass vessels in the house; and in the vicinity of the sea large receptacles may be easily filled with salt water. Where these means are not attainable, much information may be gained by watching the arrival of fishing-boats, or visiting a good fish-market at an early hour. When all actual examination of recent fish is denied, recourse must be had to descriptions, figures, and specimens.

General remarks.

Works recommended.—It is rather unfortunate for the mere English reader, that no work of merit on general ichthyology has yet appeared in that language; that part of Shaw's "General Zoology" dedicated to this subject being on the whole an inferior publication; but two continental works particularly deserve attention. The *Histoire Naturelle des Poissons*, by Lacèpede, the last edition of which was published at Paris in 4 vols. 8vo, in 1819, is the most complete and scientific, but the plates by which it is illustrated were but of indifferent execution in the early editions, though much improved in that of 1819. The *Ichthyologie* of Bloch, published in 1785, in German and French, though less extensive and systematic than the former, is superior to it in elegance and precision, and is accompanied with engravings finely coloured after nature. A short and select view of fishes is given in Cuvier's *Regne Animal.* Several good accounts of British fishes have been published, particularly by Pennant in the third volume of his "British Zoology," Donovan in his Natural History of British Fishes, and Stewart in his "Elements of Natural History." Several other works of merit will be noticed in the subsequent sketch of the history of this branch of natural history.

Nomenclature.—The terms employed in Ichthyology, will best be explained by a brief general description of the external form and structure of fishes. Their general shape is such as may best adapt them for making their way through the water. It is usually long and slender, more or less pointed at each extremity, and thickest near the middle. The head in most species is conical, flattened either *vertically* or *horizontally*, and joined to the body by a short neck, on each side of which are situated the *gills*, where these organs are present. By means of the neck, the head has a limited motion on the spine or back bone, and the several points of the spine have a freer motion, chiefly from side to side, on each other. The gills communicate with the water by means of openings, which are either naked or covered with a membrane or sort of lid, called *opercule* or *gill-cover*, having appendages termed *branchiostegous rays.* Behind the neck is situated the breast or *thorax*, which in fishes that have lungs contains those organs. The larger part of the body is the *abdomen* or belly, terminating at some distance from the tail in the *vent* or *anus.* The tail is usually long, taper, and very flexible, and terminates in a radiated membrane, often forked, called the caudal fin, situated vertically with respect to the body, or in two lobes in a horizontal position. Besides the *caudal fin*, fishes have other organs, called fins, by means of which they regulate their motions in the water. The fins most generally found in fishes are situated one on each side of the breast, whence they are called *pectoral* fins. In most fishes they are radiated membranes supported by bony or gristly *rays*, but in one division of the class they are *digitated* members, resembling the fore feet of some amphibious quadrupeds. Most fishes have a fin extending from the vent to the tail called *anal*, and one or more on the back, termed *dorsal*, and two on the belly, near the pectoral fins, and denominated *ventral.* In most species a *lateral line* runs along each side of the body, and by its diversity of colour and situation forms a distinctive mark.

Relations.—Fishes are related to the other links in the chain of animated nature, by several remarkable shades of resemblance. The cetaceous fishes nearly approach quadrupeds in their organs of respiration, and in their mode of producing and rearing their young; and some of the cartilaginous kinds resemble birds in the formation and exclusion of their eggs, while a few of the bony fishes enjoy the privilege of occasionally imitating the tenants of the air in soaring on a kind of wings above the water; eels, and some other species, might be mistaken for snakes but for their fins and gills, and most fishes agree with reptiles in the structure of the heart and temperature of the blood. The only class of the invertebral animals to which fishes bear any near affinity, is that of the mollusca, though the absence of an internal articulated skeleton in the latter forms a striking line of demarcation. One tribe of fishes is so like worms as to have been placed in that order.

Classification.—The arrangement adopted in this treatise is founded on certain diversities in the structure and functions of fishes, especially the mode of their respiration, the consistence of their solid parts, and the number and relative position of the fins. According to these differences, fishes are distributed under two principal divisions, *pulmonary* and *branchial;* the former comprehending those which breathe by means of lungs, and which are called CETACEOUS fishes, or cetaceous animals; the latter containing the numerous genera and species which breathe by means of gills, and are usually denominated the proper fishes. The first division contains only about seven genera and thirty-four species, so that it requires no subdivision; but as the other is very extensive, including not fewer than 200 genera and 1460 species, it is necessary to subdivide it pretty minutely, into sections and orders. The first section consists of the fishes which have the skeleton of a gristly consistence, or the CARTILAGINOUS fishes, as the skate, shark, lamprey, sturgeon, pipe-fish, and some others; and the second section comprehends all those which have the skeleton composed of solid bone, or the BONY fishes, as the eel, turbot, salmon, mackerel, cod, and numerous other kinds. Again, the branchial fishes are distributed under six orders; two in the first section and four in the second. Some of the cartilaginous fishes have the apertures by which the gills communicate with the water either entirely open or covered only with membrane, and they are termed *chondropterygious* fishes; while others have those apertures protected by gill-covers, and are called *branchiostegous* fishes. Of the bony fishes, some have no *ventral* fins, whence they are distinguished by the epithet *apodal;* others have the ventral fins placed between the pectoral fins and the head, and are termed *jugular;* a third order has the ventral fins situated just below the pectoral, and are called *thoracic*; and in the rest the ventral fins are observed behind the pectoral, or on the abdomen, whence they are denominated *abdominal* fishes.

Although many fishes are enumerated and described in the writings of the ancient naturalists, General remarks.

particularly by Aristotle, Pliny, Ælian, and Oppian, and some of their anecdotes are very amusing, little precise or accurate information can be collected from them, and their descriptions are so vague that modern ichthyologists are by no means agreed on the species intended by their names. Aristotle first ranked *whales* among fishes, and particularly notices the great whale or mysticete, the porpoise, and the dolphin; the last of which he describes with great accuracy, and with very little of that poetical fiction employed by his successors.

Ichthyology was first cultivated in France in the 16th century, by two physicians, Belon and Rondelet, both of whom wrote very respectable treatises on fishes about the same period. Nearly contemporary with those writers were Aldrovandi in Italy, and Gesner and Johnston in Germany, who all treated of fishes among other animals; but they copied rather from the ancients than from nature, and their works afford little that is new or useful. But in the 17th century ichthyology was materially improved by the labours of the English naturalists, Willoughby and Ray; the former of whom made many valuable discoveries and observations, which were digested and published by the latter. The *Historia Piscium* of these two friends and fellow-labourers appeared in 1686, and contains the first successful attempt at scientific arrangement in ichthyology. It is divided into three books, which treat successively of cetaceous, cartilaginous, and spinous fishes, and affords much accurate information on the structure and economy of fishes, which is still resorted to with advantage. In the beginning of the eighteenth century the system of Willoughby was further improved by Ray in his Methodical Synopsis of Fishes.

Two other illustrious naturalists, Linnæus and Artedi, also employed their talents and industry as friends and coadjutors for the advancement of ichthyology. Artedi, though the pupil of Linnæus, preceded his master in this career of improvement, but, like Willoughby, died before he could complete his labours, and left his manuscript to be revised and published by his friend. It appeared in 1738, and treats of fishes under two divisions, those with perpendicular tails and those with horizontal tails, or the cetaceous fishes. In 1766, Linnæus, in the first edition of his great work, the *Systema Naturæ*, promulgated his own system of ichthyology, in which he excluded both the cetaceous and cartilaginous fishes from the class, placing the former among the *Mammalia*, and constituting for the latter a distinct order (*Nantes*) among the amphibia. In other respects, his arrangement is the same that is here adopted for the division of the bony fishes. During the same century other systems were brought forward by Klein, Gronovius, Brunnich, and Scopoli, on the continent, and by Pennant and Berkenhout in Britain.

General remarks.

Since the commencement of the 19th century, ichthyology has been cultivated with ardour and success by several eminent naturalists, especially Cuvier, Dumeril, and Lacepede. The classification of Cuvier is given in the tables accompanying his Comparative Anatomy, and in the second volume of his Regne Animal. Dumeril's system is explained in his Traité Elementaire d'Histoire Naturelle, and Zoographie Analytique; and that of Lacepede in his Histoire Naturelle des Poissons. The following is an outline of this fashionable arrangement, which is faulty chiefly in being too artificial, containing divisions of which no examples have yet been found in nature, and in adopting the general practice of the French school of too minute division and unnecessary alteration of names.

Exclusive of the cetaceous animals, of which he treats in a separate work, *Histoire Naturelle des Cetacès*, Lacepede divides the proper fishes into cartilaginous and bony, thus forming two sub-classes, each of which is divided into four orders, and the eight orders are again subdivided into four subordinate orders or families. The principal orders which, by the author, are distinguished by numbers instead of titles, though such titles have been added to them by Dumeril, are thus characterized. The first consist of cartilaginous fishes which have the openings of the gills entirely naked; the second of those which have them protected only by branchiostegous membranes. The third comprehends such cartilaginous fishes as have gill-covers but no branchiostegous membrane; and the fourth, such of the same division as have both. The fifth order contains the bony fishes that have gill-covers furnished with branchiostegous membranes; and the sixth those which have gill-covers without membranes. The seventh such as have the membranes without the gill-covers; and the eighth such as are destitute of both. The subdivisions of the orders are denominated after Linnæus *apodal*, *jugular*, *thoracic*, and *abdominal*, though it unfortunately happens that many of these subdivisions are at present empty, and remain to be occupied by imaginary tribes and species still to be discovered. Lacepede divides the cetacea into two orders, those without teeth, of which he makes two tribes, and those with teeth, comprising eight tribes.

PART I. CLASSIFICATION AND HISTORY OF FISHES.

Chap. I. Cetaceous Fishes.

The cetaceous fishes, or cetaceous animals, as they are often called, differ in many particulars from the fishes of the other divisions. It has already been remarked, that their pectoral fins are divided like the fore-feet of the amphibious quadrupeds, though this structure is not very perceptible till they be dissected. Most of them have no other fins except the pectoral, unless the lobes of the tail be esteemed fins; but some species have also a fin upon the back; the body is thicker in proportion to their length than that of most other fishes, and instead of being covered with scales, it has a smooth naked skin, between which and the muscles lies a thick layer of fat, commonly called blubber. All the species breathe by means of lungs, and these organs are contained within the cavity of the chest, and separated from the bowels

Classification.

Classification.

by a fleshy partition resembling the midriff of quadrupeds. Their heart is double, and their blood not only red but warm. They bring forth their young alive, and suckle them at teats situated behind the pectoral fins. From this general account of their structure and functions, it appears that Linnæus, and most modern naturalists, had some reason for ranking these animals among the mammalia, though the greater number of writers on ichthyology have retained them among the fishes. They have all an opening or two somewhere on the top of the head, through which, during expiration, they throw out the water which they had previously taken into the mouth; and as this action is accompanied with a peculiar noise, it is called *blowing*, and the apertures are termed *blowing-holes*.

The cetaceous fishes differ from each other in the number and situation of the blowing-holes, and in the absence or presence and situation of the teeth. Some, as the proper whales, have no organs that can be called teeth; others, as the unicorn-fish, have only one tusk (sometimes two) projecting from the snout; a third tribe, as the spermaceti whales, have teeth only in the lower jaw; and a fourth, as the dolphins, have teeth in both jaws. These tribes are all inhabitants of the ocean; but some of the smaller species occasionally enter the large rivers and estuaries which communicate with that great expanse of waters. They usually appear in society, each species forming a groupe more or less numerous. Even the larger whales swim with rapidity, and the smaller are in general extremely active. They all appear to be carnivorous; such as have teeth living on the smaller fishes, and the toothless species devouring in great numbers the molluscous animals which abound in the seas they inhabit.

Lacepède has divided the cetaceous animals into ten tribes, and has described 34 species; but the followers of Linnæus admit only four genera, BALÆNA, PHYSETER, DELPHINUS, and MONODON. Avoiding both these extremes, six genera are here distinguished according to the differences noticed above.

GENUS 1. *Balæna*. COMMON WHALE.

Char.—No teeth; upper jaw furnished with horny plates; two distinct blowing-holes situated on the most prominent part of the head. No dorsal fin.

The common whales agree in having the head very long and thick in proportion to the body so as to occupy a third or fourth part of the animal's whole length, exhibiting great depth from the crown to the base, and more or less comprest on the sides. Its broadest part is near the middle, and it generally tapers towards the snout. The jaws are nearly equal in length, but the lower is broader than the upper, and is farther distinguished by a furrow that receives the lower edge of the horny plates which hang from the palate. These plates, improperly termed whalebone, are very numerous, and hang parallel to each other. They consist of a very long narrow plate, tapering to a point, thickest next the palate, and growing very thin at the lower edge, where they are terminated by stiff hairs. The eyes are proportionally small, and situated near the corners of the mouth. Two small orifices appear behind the eyes, forming the external opening of the ears. The pectoral fins are usually very large, and are placed behind the angles of the mouth. Four species are described by modern naturalists, and are all found in various parts of the Northern ocean.

Spec. 1. Balæna *Mysticetus*. Greenland Whale. (*La Baleine franche*, Lacep.) *Char.*—Body short and thick, with a short tail; no remarkable protuberance on the back.

Of all known animals, and indeed of all created beings with which we are acquainted, the common whale is the largest. The rhinoceros, hippopotamus, and elephant, compared with him, sink into pigmies, and even the tallest tree of the forest does not equal the length which it is said this monster of the deep has attained. Ancient writers mention whales 900 feet long; and in modern times, individuals, measuring 120 feet, appear to have been captured. At present, none exceeding half that length is observed; but it is probable that this circumstance is owing to the great number annually destroyed; so that the species is not allowed to live long enough to acquire the full size which nature has assigned it.

It is not easy to give an accurate description of an animal so vast that the eye cannot at one glance take in its whole contour; and it is therefore not surprising that the descriptions and figures which have been given of it differ in many particulars. The body is nearly cylindrical in its thickest part, very clumsy, and contracts suddenly into a smaller diameter next the tail; the head is thick, and in the larger individuals would with difficulty be contained in an ordinary dining-room; the tongue is so bulky as to have been compared to a large feather-bed, while the eye is seldom bigger than that of a full-grown ox. The back, though not marked by any particular eminence, is so protuberant that it is the only part visible when the animal lies floating at ease in the water, when it might be mistaken for a huge misshapen block of wood. The fins are very broad and strong, and the lobes of the tail extend on each side to a distance of several feet between point and point. When the animal rises fully to the surface, the top of the head and the tail, as well as the back, are visible; and it is often seen ejecting water through the two blowing-holes, in a double-arched stream, accompanied with a noise like that of a pair of double bellows in a founder's furnace, and so loud as to be heard at a distance, though it lasts but for a short time. When swimming for amusement, or in search of food, it can move at the rate of eight or nine miles in an hour; and when flying from danger, or endeavouring to escape from the weapons of its hunters, its velocity is much greater. The young whales are more active than the old, and offer greater resistance when attacked. The back of a full-grown whale is of a deep-shining black colour, but the lower part of the head and body is whitish. The young animal is of a lighter colour. The blubber of a healthy whale is reddish, but when it is of a yellow colour it is found to yield less oil.

As these animals have no teeth, they are compelled to feed on such aliment as may be easily swal-

Classification.

owed, such as the mollusca and crustacea. The present species is supposed to live chiefly on *medusæ* and *clios*; and, as his gullet is very narrow for so large an animal, such food is well adapted to his nature. When he comes into a part of the sea, where he can obtain a sufficient supply of these animals, the whale swims rapidly forward through the shoal, taking both water and food into his capacious mouth. The small animals are entagled among the hair and between the plates of the whalebone, and carried towards the gullet, and during the act of swallowing, the water which had not escaped by the corners of the mouth, is forcibly ejected through the blowing holes.

The natural term of a whale's life can only be conjectured, by comparing his bulk with that of the largest beasts and birds which are known to attain a great age. As the elephant and the eagle have been found to live a hundred years, it is supposed that the whale, if suffered to die a natural death, might continue his existence during ten centuries. The female whale is not easily distinguished from the male at sea, except she be in company with a young one; she is said to produce two young at a birth, which she rears with the tenderest care, supporting them under her fins, and defending them from the attack of enemies. While under the care of the dam, the young whales, or *short-heads,* as they are then called, are extremely fat, and yield more oil in proportion than at any subsequent time.

Though his bulk be so enormous that he could nearly overset a small ship, and his tail so strong and muscular, that with one blow he could shiver a boat to pieces, the whale, when unmolested, is one of the mildest and most inoffensive animals; but this pacific disposition does not exempt him from the assaults of numerous enemies. The saw-fish attacks him with the formidable weapon projecting from its snout; the shark and the gladiator dolphin tear him with their sharp and strong teeth; the *lepas* insinuates itself into his blubber, and the whale-louse infests his skin, and probably causes there an intolerable itching. Of his more terrible conflicts with his principal adversary man, and his conduct when wounded with the harpoon or lance, an account has already been given under Fisheries. The principal spoils derived from that warfare are train-oil and whale-bone; but almost every part of the animal is applied to some useful purpose by the natives of the dreary coasts which it frequents. The flesh is eaten, the sinews are split into thread, the intestines are employed instead of glass or horn for windows, and the bones for beams and rafters in building huts.

Though not properly a British fish, the whale has occasionally been cast on our coasts, and even taken in our seas. In the first case it is deemed the property of the king and queen, the former of whom claims the head and the latter the tail.

Spec. 2. Bal. *Gibbosa.* Scrag Whale. (*La baleine bossue,* Lacep.) *Char.*—Five or six protuberances on the back; horny plates, white.

In its general appearance, colour, and ordinary dimensions, this species resembles the common whale, but is thinner or leaner, and, on a near inspection, is readily distinguished by the dorsal prominences near the tail, and the whiteness of its whalebone, which is not so easily split into plates as that of the former species. It is found in the same latitudes, but is most frequent on the coasts of New England. Though apparently leaner, from being less muscular, it yields a considerable quantity of oil.

Classification.

Genus 2. *Balænoptera.* Finned Whales.

Char.—The upper jaw furnished with horny plates; two blowing holes, separate from each other, situated about the middle of the upper part of the head. One dorsal fin.

The presence of the dorsal fin is not the only distinguishing characteristic of this new genus, though it is adopted by Lacèpede to discriminate the finned whales from the proper balenæ. The whales of the present tribe have a much more slender body, a shorter head, a sharper snout, smaller pectoral fins, and a more taper tail, than the species already described, and their eyes are placed rather before than above the pectoral fins. In their general structure and manners they resemble the common whales, but are said to feed on herrings and other small fish. This tribe, like the former, contains four species, three of which are distinguished by having the throat and belly marked with longitudinal folds.

Spec. 1. Balænoptera *Gibbar.* Gibbar, or finfish. *Char.*—Both jaws pointed, and of equal length; lower part of the throat and belly smooth; horny plates, short.

In its ordinary length, the gibbar nearly equals the Greenland whale, but it is much smaller in circumference, and therefore appears longer in proportion. The head is conical, and sharp pointed at the snout; has not any remarkable protuberance on the summit; and its junction with the body is distinguished by only a slight depression. The tongue is proportionally small; the pectoral fins oval, and about one-eight of the whole length; the plates of whalebone are extremely short, but terminate in very long hair, which is often found twisted together. The dorsal fin is triangular, a little curved backwards at the tip, and is in length about 1-15th of the whole animal. The throat and belly are of a beautiful white, and the back and upper part of the head of a brilliant brown colour.

The domain of the gibbar is much more extensive than that of the balenæ; for though it be found most frequently in the icy sea and the northern Atlantic, it has been seen off the coast of Britain, in the Mediterranean, and even as far south as the bay of Panama, near the equator. It feeds on small fish, especially mackerel and herrings, which it swallows whole. It is more active and dangerous than the common whale; darts forward with amazing velocity; spouts up water to a great height; and when attacked, strikes furiously with its fins, and lashes with its long and comparatively slender tail, so that it is very hazardous to approach. The whale fishers therefore seldom assail it, especially as it affords but an inconsiderable quantity of oil, and the whale-bone is of little use. Its flesh is much coveted by the Greenlanders, and is said to taste like that of sturgeon.

Spec. 2. Balænop. *Rorqual.* Rorqual, or Round-lipped Whale. (*Balæna Musculus,* Lin.) *Char.*—Lower lip rounded, more advanced and broader than the upper; head proportionally short; longitudinal folds in the skin of the throat and belly.

The rorqual attains the length of 78 feet, and circumference of from 33 to 36 feet, in the thickest part of the body. It is remarkable for the blackish colour which prevails on the upper part of the body, while the lower part is white.

The lower jaw terminates in a semicircular margin. The upper jaw is much shorter and narrower than the lower, and shuts into a furrow in the latter. The tongue is of an enormous size, soft, spongy, covered with a thin skin, and furnished on each side of its base with a red round muscle, by means of which it may be drawn back towards the gullet, at the pleasure of the animal. The horny plates are black, and the largest of them scarcely exceed three feet; and the terminating hairs are long, but unequal, tufted, and of a black colour.

Owing to the great depth of the lower jaw, in proportion to the upper, the eyes appear to be situated so near the top of the head, as to be visible above the water, when this whale is swimming at the surface. Hence, the orifices of the blow-holes are very near the eyes, and they are situated on a kind of protuberance in the form of a pyramid.

The body is very thick just behind the nape of the neck. The swimming paws are lance-shaped, and inserted at a considerable distance from the angle of the mouth, though nearly in the same line with it. The dorsal fin commences exactly opposite the anus, and extends as far as the tail, which, as usual, is divided into two lobes, that are about 18 feet anus from tip to tip. The whole lower part of the head and body of this animal is wrinkled into numerous longitudinal folds, which the animal has the power of inflating, apparently through the means of the blow-holes, and thus rendering himself of considerably less specific gravity.

The rorqual is found in most parts of the Northern ocean, and a very large sized individual is described by Sibbald as having been taken near Abercorn castle in Scotland, in the year 1692. It had been observed many years before by the fishermen in pursuit of the shoals of herrings, on which it is supposed to feed, and was recognised by them in consequence of a wound in the dorsal fin, which it had received from a musket ball.

GENUS 3. *Narhwalus.* (*Monodon*, Lin.) NARHWALS.

Char.—One tusk, or two projecting from the upper jaw, with no teeth in the lower jaw. Blow-holes united externally into one orifice at the upper and back part of the head. No dorsal fin.

The singular species, two of which only are yet known that make up the present genus, differ from all other cetaceous fish in their external form, and the weapons with which nature has furnished them. The body, instead of being considerably lengthened, is rather of an oval form, rounded at the snout and tapering towards the tail, usually broadest from side to side, and a little flattened from back to belly. The tusk, or rather horn, which projects from the snout, is generally single, and in that case is always on one side, but in the young animal two are often observed, and such skulls as have been examined always exhibit two sockets. Hence there is reason to conclude that the animals have naturally two horns, and, in most of the individuals taken, one has been lost from violence; consequently the names *monodon* (one tooth) and sea unicorn, are improper. They are inhabitants of the northern seas and prey on fish.

Spec. 1. *Narhwalus vulgaris*, Common Narhwal. (*Monodon monoceras*, Lin.) *Char.*—General form ovoid; head about one-fourth of the body; horn spirally grooved.

The common narhwal, or, as it is usually called, the sea unicorn, attains a considerable size, having been seen above 22 feet long by 12 in circumference. The head appears united immediately to the body, from which it is distinguished only by a slight depression behind the blow-hole. The back is broad and convex, and marked with numerous dark spots, while a whitish streak extends along its middle from the blow-hole to the tail. The pectoral fins are small, and the lobes of the tail arched forwards, and blunt at the tip. The prevailing colour of the upper parts is a dark brown, but the throat and belly are white. The horn is almost always single, situated on the right side of the head, and is often 12 or 15 feet long.

Though apparently a clumsy animal, the narhwal swims very swiftly, but with so little caution as sometimes to strike against a ship or other hard object, and either break or dislocate its horn. It dives well, and, when alone, readily escapes pursuit, but as it is very sociable, many individuals being often seen together, it is sometimes so embarrassed among the rest as to become an easy prey to its pursuers. It appears a timid inoffensive animal, and the accounts given by fishermen of its attacking the whale are not well authenticated.

The blubber is not very thick, but produces very fine oil; but the narhwal is hunted chiefly for its tusk, which forms ivory of a quality superior to that of the elephant. Many ornamental pieces of cabinet work are constructed of it, and in the royal castle at Rosenberg, near Copenhagen, is a throne composed of these tusks.

An animal similar to the narwhal, but having short crooked tusks, is sometimes seen in the Greenland seas. It is named *anarnak*, and has been by Lacepede elevated to the rank of a new genus. It does not merit particular attention.

GENUS 4. *Physeter.* SPERMACETI WHALES, or CACHALOTS.

Char.—Upper jaw very deep and broad, either destitute of teeth, or shewing only imperfect teeth, concealed by the gums; lower jaw narrow, armed with thick conical teeth. Blow-holes united externally into one orifice, situated at or near the end of the snout on the upper part. Head nearly equal to half the whole length of the animal.

The characters of this genus are strongly marked. The enormous size of the head, which is never less than one-third of the whole bulk of the fish, is occasioned by the peculiar conformation of the upper jaw. Between the proper bones of this jaw and the snout are several large cavities, bounded and separated by cartilages, and containing a great quantity of a substance whose nature partakes both of oil and wax, and which is commonly called *spermaceti.* Below these cells lies the proper cavity of the skull, including a very small brain, and in the margin of the jaw is a furrow, that, when the mouth is closed, receives and nearly conceals the disproportionate lower jaw. The teeth are commonly short and thick, bluntly pointed, and a little curved at the tip; the tongue is small; the pectoral fins short, but in other respects the cachalots resemble the whales in their conformation, though their habits and manners are very different. The cachalots are voracious animals of prey, and attack even sharks and other large fishes with fierceness and vigour.

Lacepede has divided the Linnæan genus *physeter* into three: *cetodon*, having the common blow-hole at the point of the snout; *physalus*, having it at some distance; and *physeter*, differing from the catodontes in having a dorsal fin. The only known species of physalus is remarkable for its cylindrical form. Eight species of physeter have been described.

Spec. 1. Physeter *Macrocephalus.* Great headed Cachalot. (*Cetodon Macrocephalus*, Lacep.) *Char.* —Tail of small diameter, and conical; no proper dorsal fin, but a protuberance on the back near the tail.

The present species, generally adduced as that from which spermaceti is most commonly obtained, is not inferior in bulk to the Greenland whale, and is much superior in courage and ferocity. It is more remarkable than any of its tribe, for the enormous size of the upper, and smallness of the lower jaw, which contains about 46 very thick and strong teeth. The protuberance on the back is of a considerable size, and an imperfect fin is often observed near the tail; the mouth is capacious, the eye small, but more prominent, and situated higher in the head than in most other whales. The back is of a dark blue or slate colour, and the belly white. The blubber yields a good deal of very fine oil, and, besides spermaceti, the perfume called ambergris is said to be secreted by this as well as some other species of cachalot.

Spermaceti whales are found in various climates, but most abundantly in the Southern Atlantic and Pacific oceans, on the coasts of New Holland, and in the Antarctic regions near the ice that appears to surround the South Pole. They have also been observed in the Mediterranean, and have occasionally appeared in the British seas. The species here described feeds chiefly on lump-fish and dog-fish, and has been known to swallow a large shark.

GENUS 5. *Delphinus.* DOLPHINS.

Char.—Teeth in both jaws. Blow-holes united in one external orifice, situated very near the summit of the head.

This is the most numerous tribe of cetaceous fishes, comprehending about 13 species. They agree in having both jaws long and narrow, furnished with conical teeth, and the common orifice of the blow-holes shaped like a crescent, with the horns directed backwards. Eleven of the species, among which are the porpoise, the grampus, and dolphin, have a dorsal fin; but the others are destitute of that appendage, and have been separated by Lacepede to form his genus *Delphinaptenis* (dolphins without fins). These fishes are the most ferocious of the order, and hunt in packs like hounds. The species are much smaller than those of the former tribes, are less confined to particular seas, and often make their appearance in the larger rivers.

Species 1. *Delphinus vulgaris.* Common Dolphin. (*Delphinus delphis*, Lin.) *Char.*—Body and tail elongated; snout very prominent, flattened, and oval at the tip; teeth sharp; one dorsal fin, hollowed at its posterior margin, and curved backwards.

The reader who has perused the animated descriptions of the dolphin in the writings of the poets, and has contemplated the graceful and elegantly curved form assigned to it in the blazonry of heralds, will be much disappointed to find that the descriptions and figures are merely fabulous. In fact, the real dolphin has a form far from elegant, and displays nothing of the large head, with pendant lips and projecting eyebrows, which are seen in the usual paintings and engravings of the animal, nor is it remarkable for intelligence or sociability towards mankind. It is generally about nine or ten feet long, is slender in proportion to its length; the snout bears some distant resemblance to the beak of a goose, whence it has been called the sea-goose; its mouth opens very wide, and is well furnished with sharp teeth. The upper part of the body is of a black colour, and the lower parts white. It is found in most parts of the Atlantic and Pacific oceans, where numbers of them are often observed around a ship, gamboling about in the sunshine, and watching for offal that may be thrown into the sea. On these occasions it is said to leap so as to display much of its body above the surface, and to bend its back into a slight arch. It preys on the smaller fish, which it pursues with great swiftness through the water.

The dolphin has occasionally been seen on the coasts of Britain, where it was formerly in much esteem as a delicacy for the table. It was eaten roasted and served up with a sauce composed of porpoise flesh, bread-crumbs, sugar, and vinegar.

Spec. 2. Delph. *Phocæna.* Porpoise. *Char*—Body and tail elongated; snout short and rounded; teeth pointed; one dorsal fin, triangular, with straight sides.

The general form of the porpoise is that of a double cone with the point next the tail long and sharp, while at the opposite extremity it is short and obtuse. In other respects it resembles the dolphin, except that its body is more clumsy and the back fin bounded by straight lines. The prevailing colours of this species are also similar to those of the former; but the porpoise is a much more common fish, and is frequently seen in great numbers on the coasts and in the large rivers of Britain, especially when mackerel, herrings, and salmon begin to make their appearance. At these times the porpoises may be seen in full chace like a pack of dogs in pursuit of a hare. They are also very commonly observed when the sea is rough, during, or before a storm, darkening the surface of the water with their dusky backs, and sporting about upon the elevated waves. When they find a scarcity of fish, which

Classification.

form their ordinary food, they are said to dive to the bottom and root like hogs among the sand for sand-eels and sea-worms. From this circumstance, as well as from the great quantity of fat below the skin, the porpoise has received, in most languages, the name of sea-hog. The common English name has the same meaning, being derived from the Italian.

Spec. 3. Delph. *Gladiator*. Gladiator or Sea-sword. *Char.*—Body and tail elongated; upper part of the head very convex; snout very short and blunt; teeth sharp and curved; dorsal fin very near the neck, and extremely long.

This formidable animal, the terror of the Greenland whale, has often been confounded with the grampus, a species nearly as well known as the porpoise, but it differs from that species in many important particulars;—the grampus has the top of the head rather flat, the snout less obtuse, the upper jaw longer than the lower, while in the present species both are of equal length; the teeth of the grampus are blunt, and the dorsal fin placed about the middle of the back, and proportionally not near so long as in the gladiator. Indeed, the remarkable length of this fin in the present species has occasioned it to receive the name of sea-sword. The ordinary length of the animal is about 24 feet, and the dorsal fin is at least four or five feet long. It gradually tapers to a point, and, from its firmness, proves a very formidable weapon in those contests which he maintains with the whale. Only the young whales are attacked by the gladiators, and a troop of these animals combines in the assault. They fall suddenly on their prey; some seize on the tail in order to prevent the deadly blows which that organ might inflict on their companions, while the rest attack the enemy towards the breast and head. The whale, harrassed by the number of his foes, and breathless with his struggles to defend himself, opens his vast mouth, when some of the assailants lay hold of his lips, and others fix upon his tongue, which is to them a favourite morsel. But it is only from necessity that the gladiators attack a whale, as their natural food consists of the smaller fishes.

This species is most common in the Northern ocean, but it has been found in the Mediterranean, and has occasionally appeared in the large rivers of Britain. A male gladiator was taken in the Thames in the summer of 1793. After being pierced with nine harpoons, it ran off with the boat in which were four persons, and dragged it twice from Blackwall to Greenwich, and once in spite of the repeated wounds inflicted by the spears of the boatmen, as it appeared above water. As long as it retained any power of resistance, the boats which came forward to aid in the attack durst not approach it, so terrifying were its efforts to repel the assault, but it was at length killed opposite Greenwich hospital. It measured 31 feet in length and 12 in circumference, and was probably one of the largest of the species ever taken. So great are the courage and ferocity of these animals, that, when pressed by hunger, they have been known to seize and carry away the carcase of a whale that had been harpooned, and was apparently in the sure possession of its captors.

GENUS 6. *Hyperöodon*. BEAKED-WHALE, or *Butskopf. Delphinus Butskopf.* Lin.

Char.—The palate furnished with small teeth. One dorsal fin.

A peculiar animal, called butskopf by the Greenlanders, and beaked whale by Pennant, has been usually regarded as a species of *Delphinus*, but it differs from that tribe in having teeth in the palate as well as in both jaws, and in the snout being suddenly contracted into a sort of beak. Only one species has yet been discovered. It is generally found in the Northern ocean, but one individual was taken near Malden in Essex in the year 1717. It was then considered a species of *Balæna*, as its teeth had not been observed, but it was afterwards deemed a variety of the grampus. It grows to the length of 20 feet; is very tame, and will accompany the whale ships to a considerable distance.

CHAP. II. CARTILAGINOUS FISHES.

All those fishes which have the muscles supported by a flexible elastic skeleton, resembling cartilage or gristle rather than bone, are denominated cartilaginous, and form a natural division, agreeing together in several other characters. They have all openings on the neck or head for admitting water to the gills, but either without any gill-cover, or with one that is different from the same organ in bony fishes. Few of them have a scaly skin, and though they are all truly oviparous, many tribes hatch their eggs within the oviducts; their teeth are seldom set in solid sockets, but are inserted in the skin of the lips or palate, and the belly is rarely protected by ribs or solid parts. If the cetaceous fishes be excepted, the largest, strongest, most ferocious, and most intelligent fishes are found in the present division. They differ from each other by the manner in which the gills are protected. Some have no gill-cover, as the *Chondropterygii*; others are furnished with a gill-cover, and are called *Branchiostegi*. The lamprey, skate, shark, and some others belong to the first order; the sturgeon, lump-sucker, trunk-fish, pipe-fish, and some others to the second.

ORDER I. CHONDROPTERYGIOUS FISHES.

GENUS I. *Petromyzon*. LAMPREY.

Char.—No ventral or pectoral fins; 7 openings to the gill on each side of the neck; a spout hole on the top of the neck.

The lampreys have a long and slender form, with a long taper tail terminating in a fin on each side, and a mouth furnished with teeth, and having the skin extended into a sucker, by which they attach themselves to other fish and suck their blood, or to stones and similar objects, and thus drag themselves from place to place, for they swim with difficulty. From their being commonly found sticking to stones, which they are supposed to lick or suck, has been derived their usual names, which signify stone-licker. Most of the species, of which at least nine are known to naturalists, inhabit the open sea, and visit the rivers only at certain periods.

Spec. 1. *Petrom. Vulgaris.* Common Lamprey, or Lamper Eel. *P. Marinus*, Lin. *Char.*—Mouth furnished with about 20 rows of teeth.

The common lamprey is esteemed a great delicacy, and is said to be the species that occasioned the death of our Henry I., who, as historians inform us, died of a surfeit by eating lampreys. It sometimes attains a large size, and has been found of the weight of three pounds. The mouth is round, and placed a little obliquely below the snout; the edges are jagged, and sucker so powerful, that a fish of the weight just mentioned has been known to support a stone four times as heavy as itself. The teeth are small, placed far within the mouth, and arranged in circular rows. The body is of a dusky colour, irregularly marked with dirty yellow spots, so that the animal has a disagreeable appearance. It ascends the rivers about the latter end of winter, or the beginning of spring, and, after remaining a few months, returns to the sea. Lampreys are found in most abundance in the Severn, and are in the greatest perfection during March, April, and May, growing wasted and flabby on the approach of hot weather. They are usually taken in the nets laid for salmon or chad, and sometimes in baskets placed on purpose at the bottom of the water. They contain a good deal of blood, which is saved and employed as an ingredient in the sauce served up with them. These fish have long been esteemed a delicacy fit for princes; and it is a custom in the city of Gloucester to present the reigning monarch periodically with a lamprey pie. As this offering is generally made at Christmas, when lampreys from their scarceness fetch a high price, it becomes very expensive to the corporation.

Two other species of lamprey are found in the British seas and rivers.

Genus 2. *Gastrobranchus.* Hag.

Char.—No ventral fins; two openings to the gills on each side, situated below the belly.

The present genus was formed by Bloch, in order to receive into the class of fishes to which it was found properly to belong, an extraordinary animal, formerly called *Myxine glutinosa*, and placed by Linnæus among the intestinal worms. Two species are known, but the first only has been accurately examined.

Spec. 1. *Gastrob. Glutinosus.* Glutinous or Blind Hag. *Char.*—Dorsal fin very low, and united with that of the tail.

The blind hag is a parasitical animal, and penetrates into the body of large fish, whence it glides into their bowels, and probably feeds on their contents. Its lips are soft and extensile, and in the mouth is a double row of hard teeth, by means of which it penetrates through the skin and flesh of its prey. The back is blue, the sides reddish, and the belly white. It is found principally in the Northern ocean, especially upon the European coasts. It is said to hide itself in the sand, and thence dart out upon its prey. It is very destructive to turbots, and has been known to devour them on the hooks before the fishermen returned to examine their booty.

Genus 3. Raia. *Ray.*

Char.—Ventral fins behind the pectoral; two branchial openings on each side on the lower part of the body; mouth inferior; body much flattened.

The rays are remarkable for their broad, flat, and thin body, extending laterally into triangular or circular *wings* forming the pectoral fins; a small pointed head, not distinguishable from the body, with the mouth below the snout, and both eyes on the back of the head; a very long tail; a double ovary, and destitute of air bladders, so that they commonly remain at the bottom of the water, and rise in it with difficulty. Above thirty species have been described; but it is doubtful whether different sexes have not been taken for distinct species, as it has been ascertained, that in many the males differ from the females in having sharp teeth and spines on the back. They are all inhabitants of the sea, where they live chiefly on shell fish and the remains of animal bodies. They generally produce their young by one at a time, contained in a flat four-cornered membrane, which is called a *skate-purse.* All the species are eatable, and some of them grow to an enormous size, weighing 250 pounds, and proving dangerous enemies even to man.

Spec. 1. Raia *Batis.* Common skate. *Char.* Sharp teeth (in the males;) a single row of spines on the tail (double in the males.)

This well known fish requires no particular description of its external form, but it merits notice as affording a good and easily procurable example of the structure and habits of the tribe. The middle part of the animal, consisting of the principal cavities, bounded by cartilages, and covered with longitudinal masses of flesh, bears but a small proportion to the triangular wings, or pectoral fins, as their radiated structure proves them to be, though some have regarded them as part of the body. These fins and the tail form the principal moving organs and weapons of the skate. With the former he flaps the water so as to raise himself from the bottom; and when thus raised, falls down with all his weight on his destined prey, and overwhelms it. With the latter he regulates his motions through the water, and when he approaches a small fish, strikes it forcibly, so as to wound it to death with the sharp recurved spines with which the tail is furnished, or suddenly twines that organ round the object of his pursuit, and thus secures his booty. But more commonly he lies at the bottom concealed among the sand or seaweed, and when a fish approaches his den, slily and suddenly strikes it with his tail and inflicts the mortal wound. Behind the eyes, and opposite the mouth the skate has two openings for ejecting water, and as these communicate with the mouth, it appears, on holding the fish to the light, as if it had been pierced through with a double hook or spear. The head is inserted deeply between the wings so as to enter the cavity of the chest, and the tail in like manner joins the belly. In cleaning a skate for sale, the fish-women generally cut both head and tail away, leaving almost nothing but the fins. Few persons are aware that the root of the tail, or *rump* as it is called, affords one of the most delicious parts of the fish, and that the good women reserve them as separate and lucrative articles of traffic. Each spine is placed in a circular cartilage, by which it is secured in the fleshy part. The males have more spines than the females.

These fish are found in abundance on the coasts of Britain, and on the open sea on the surface of and banks. They are in season from November to May, but are in greatest perfection in the latter month. The young skate or *maids*, are good throughout the year. A full grown skate is much improved in tenderness and flavour by keeping for several days.

Spec. 2. Raia *Torpedo*. Torpedo, or Cramp-fish. *Char.*—Teeth sharp. No spines on the body or tail. Body nearly oval. Two dorsal fins.

The torpedo is one of those fish which possess the power of stunning its prey, or an assailant, by means of certain electrical or galvanic organs placed within the body, thus securing the one and repelling the attacks of the other. In its general form, it differs much from most other rays. The head is rounder and more confounded with the pectoral fins; these fins are also rounded, so as with the head to form nearly a circle, and between the pectoral fins and tail are two other rounded fins. The tail is terminated by a double fin. But the most extraordinary part of the animal is the electrical apparatus. It is double, situated on each side of the head and thorax, just below the upper skin, and extends in an arched form from near the snout to the cartilage that supports the partition between the thorax and belly. Each organ consists of several hundred hollow prismatic tubes, some six-sided, others five sided, and others quadrangular, placed perpendicularly and closely compacted together, but having between each pair a narrow interstice. The middle tubes are the longest, and they diminish in length towards the sides and extremities of the row. The whole apparatus is connected with the neighbouring parts, particularly the muscles, which move the pectoral fins by cellular membrane and tendinous fibres, and is well supplied with nerves. When the tubes are separated from each other they appear cylindrical, and as if formed chiefly of thin transparent membranes, filled with a gelatinous substance. Their number varies with the size of the fish, as in a small torpedo about 500 have been counted, while in a very large one they have been found to exceed 1180. That this apparatus is an offensive and a defensive weapon, whose action is regulated by the will of the animal, is evident from the concomitant muscular exertions made by the fish, when it exercises this curious faculty. The eyes are drawn back, and the upper and anterior parts of the apparatus are contracted, and apparently put on the stretch before giving the shock. This shock resembles rather the concussion felt on touching a moderate galvanic pile, than that which is experienced from the discharge of a Leyden phial. It is not a sudden violent explosion, but a series of successive shocks, stronger or weaker according to the size and vigour of the fish.

The torpedo is found in various seas and parts of the ocean, especially in the European seas, the Mediterranean, the Persian gulf, and near the Cape of Good Hope. It has been taken on the coast of Ireland.

Ten other species are found on the British coasts.

Genus 4. *Squalus*. Shark.

Char.—Ventral fins below the belly. Five, six or seven branchial openings on each side of the body.

In the form and situation of the mouth and general structure of the body, and manner of producing their young enveloped in purses, the sharks resemble the rays; but they differ in having a longer and rounder body wanting the enormous pectoral fins, a short and thick tail with a double extremity, the upper part of which is larger than the lower, and in the structure and arrangement of the teeth, which are inserted into the lips and palate, and connected with numerous strong muscles by which they are elevated or laid flat at the pleasure of the animal. Many of this tribe are of enormous size and strength, and are justly dreaded not only by their fellow inhabitants of the deep, but by man himself, for whose flesh they are supposed to have a peculiar predilection. They are all fish of prey, live commonly in the bottom of the sea, and approach the shore or rise to the surface only when in search of food. About 30 species have been distinguished; at least 12 have been seen on the British coasts. Among these are several that, from their ferocity, and pursuing their prey in concert, are called *sea-dogs*, *hounds*, and *beagles*.

Spec. 1. *Squalus* Carcharias. White Shark. (*Requin*, Lacep.) *Char.*—One anal fin; teeth triangular, and jagged on the edges.

Spec. 2. *Sq.* Maximus. Basking Shark. *Char.*—Teeth a little conical and without serratures.

Two very large species of shark have been thus designated and characterized by naturalists, but the descriptions given of the second, especially as to its manners, differ materially from each other. All allow that it is larger than the first, and that it is less ferocious and formidable; but some writers, as Pennant, describe it as perfectly harmless, and subsisting on sea-weed and mollusca, while Lacepede says that it greatly resembles the white shark in manners as well as conformation, differing chiefly in its teeth.

The white shark is a most terrific animal. His size is so large that he can swallow an ordinary man. His mouth opens to a great extent and displays six rows of sharp and strong teeth, which when raised for action appear like so many barbed spears; his eyes are fierce and glaring, his motions rapid, and his whole aspect threatens instant destruction to whatever creature ventures to oppose him. The Shark is most frequently met with in the seas of tropical regions, where it accompanies for days together the ships which are sailing in those climates, anxiously watching for offal and dead bodies which may be thrown overboard, and ever on the watch to seize those unfortunate beings whom accident may plunge into the deep. If such mischance befal any of the sailors, he is almost sure to become a prey to the voracious jaws of the shark, and may deem himself happy if he escape with the loss of a limb, which that savage creature easily severs in a moment, or strips the flesh from the bones. Only one chance remains of escape; and some intrepid fellows availing themselves of their knowledge of this animal's movements, have even ventured to attack him in his native element. In order to seize his prey with advantage, the shark is obliged to turn on his side, and in this

Classification.

Classification.

ttitude a daring negro, armed with a sharp knife, has occasionally succeeded in ripping up his belly before he could effect his fatal spring. A remarkable instance of such intrepidity is related of a sailor, who saw a favourite messmate devoured by a shark, and, determined to avenge the death of his friend, plunged well armed into the sea, and not only executed his purpose of vengeance, but recovered the body of his comrade for burial on shore. The ferocious manners of this species, are well delineated in the following verses:

> " Increasing still the terrors of the storms,
> His jaws terrific arm'd with threefold fate,
> Here dwells the direful shark. Lured by the scent
> Of steaming crowds, of rank disease, and death,
> Behold! he rushing cuts the briny flood along;
> And, from the partners of that cruel trade
> Which spoils unhappy Guinea of her sons,
> Demands his share of prey, demands themselves.
> The stormy fates descend. One death involves
> Tyrants and slaves; when straight their mangled limbs
> Crashing at once, he dyes the purple seas
> With gore, and riots in the vengeful meal."
>
> THOMSON.

Both these species are ranked among the British sharks. The second is much sought after in the northern seas for its liver, which often weighs half a ton and yields a large quantity of oil.

GENUS 5. *Pristis*. SAW-FISH.

Char.—Snout much elongated, depressed, and furnished on each side with a row of teeth.

Spec. 1. *Pristis Antiquorum*. Common Saw-fish. (*Squalus Pristis*, Lin. *Le Squale Scie*. Lacep.)

The saw-fish has been ranked by most modern naturalists among the sharks, which it resembles in its general structure and manners; but the peculiar form of the snout and the terrible weapons with which it is furnished, entitle it to the rank of a new genus, and it has accordingly been separated by Mr Latham. The snout resembles the blade of a sword, with two serrated edges. It is covered with a skin as hard as leather. The serratures, though called teeth, are properly branches from the trunk of the snout projecting through the skin. The mouth is furnished with numerous blunt teeth set so close together as to form one solid mass, and at the top of the head are two spout holes. The pectoral fins are large and broad, and besides these the fish has two dorsal and one anal fin. It has been represented as a very large animal, but few individuals are at present met with more than 15 feet long, with the snout about 6 feet. It is found chiefly in the Northern ocean, and on the coast of Africa.

In giving the history of the Greenland whale, the saw-fish was mentioned as one of its most formidable enemies. Its attack is maintained with great fury and obstinate perseverence. The whale in vain attempts to strike his adversary with his tail, one blow of which would effectually terminate the conflict. The saw-fish uniting agility to strength, raises himself to the surface of the water, and darting on the whale inflicts on his back a terrible wound. The unwieldy monster again essays to strike him with its tail, but is foiled by the activity of the saw-fish, and is generally compelled to yield to an enemy so insignificant in bulk, but so formidable in offensive weapons.

GENUS 6. *Lophius*. ANGLER.

Char.—Ventral fins below the throat; numerous sharp teeth; a single branchial opening on each side of the body; pectoral fins attached to appendages like arms.

Spec. 1. *Lophius Piscatorius*, Fishing L. Toad-fish or sea-devil. *Char.*—Body, broad and flat; head very large and rounded.

The fish commonly called toad-fish or sea-devil, has a very deformed and disagreeable appearance. Its head is enormously large, exceeding in dimensions the whole body, and on each side it is beset with numerous spines; the mouth is exceedingly wide, and the pectoral fins extend far from the body. From the upper part of the head and body arise five or six strong filaments, terminating in oblong knobs; and it is supposed that the animal uses these organs as an angler employs his line and bait, to allure the small fish which form its principal food. Hence the names of angler and fishing-frog, by which it is usually distinguished, while the other appellations are expressive of its extreme deformity. It grows to a very large size, being sometimes found above five feet long, with the mouth a yard wide. It inhabits the northern seas, and frequents the coasts of Britain. It is considered a great enemy to the small sharks, called dog-fish, and these are often found in its stomach; hence it is held in great esteem by the fishermen, and is generally set at liberty when taken.

Beside the tribes now described, the genera *Aodon*, containing 3 species; *Balistes*, 26; and *Chimera*, 2,—belong to this division.

ORDER II. BRANCHIOSTEGOUS FISHES.

GENUS 10. *Accipenser*. STURGEON.

Char.—Opening of the mouth situated in the lower part of the head; retractile, without teeth, and furnished on the fore parts with tendrils. Body elongated, and covered with numerous rows of hard plates.

The sturgeons, of which four species are at present known, are inhabitants of the salt waters, though at certain seasons they ascend the larger rivers. They have a blunt head with a tubular mouth, and one narrow branchial opening on each side of the body. From the rows of plates with which the body is covered it appears angular, and is very long in proportion to its thickness. All the species are eatable; the flesh is reckoned a great delicacy, and is usually seen in this country salted or pickled; from the eggs is prepared *caviar*, and from the air bladders *isinglass*.

Spec. 1. Accipenser *Sturio*. Common Sturgeon, *Char.*—Lips cleft; four tendrils, commonly nearer the extremity of the snout than the opening of the mouth.

The length of this fish varies from 6 to 16 feet. The snout is long and blunt; the mouth resembling the opening of a purse, and can be drawn in or thrust out; the body is environed with five rows of plates, which give it a pentagonal form; it is of a dirty olive colour above, and a silvery white, with black spots, below. The tendrils are several inches long, white in the middle, and so nearly resembling worms, that it is supposed they are mistaken for such by the fish which approach the sturgeon, which thus become his prey. Being a clumsy animal, he is indebted more to artifice than strength for obtaining food. He hides himself at the bottom of the water among the mud or sea-weed, shewing only his long tendrils; and when a worm or small fish is carried near his mouth, he makes a snap and swallows it.

The sturgeon is found in almost all the seas of the northern hemisphere, and especially in the Mediterranean, the Caspian, and the Black sea. Towards spring these fish enter the great rivers to deposit their spawn, and at that time they are taken in great abundance in particular rivers. In some of the rivers of Virginia they are so numerous between May and July, that 600 have been taken in two days with spears or harpoons. In ascending the rivers, they sometimes leap several yards out of the water, and in their fall occasionally overset or sink the small canoes of the Indians. In Britain they are seen chiefly in the Eden and the Esk, but are not numerous. One of the largest ever seen in this country, weighing 460 pounds, was caught some years ago in the Esk.

Caviar is prepared by salting the spawn, freed from the skin and fibres, draining off the moisture, and packing it in casks. Isinglass is made from the inner coat of the air-bladder; but most of what is sold is obtained from the *beluga* or white dolphin.

Genus 11. *Ostracion*. Trunk-fish.

Char.—No ventral fins; body covered with a bony crust; cutting teeth in each jaw.

Few tribes of fish have a more extraordinary appearance than the present. The whole body is enveloped in a bony covering, as if shut up in a box or *trunk*, or inclosed in a coat of mail, by which the fish is as well defended as a tortoise by its shell. Most of the species are eatable, but the flesh is in small proportion. Of the 15 known species, the following is the most remarkable.

Spec. 1. Ostrac. *quadrangularis*. Lacep.—Quadrangular Trunk-fish. *Ostr. cornutus*, Lin. *Char.*—Body quadrangular, with four spines, two projecting before the eyes, and two below the tail.

It occurs in the Indian ocean and Red sea.

Genus 12. *Tetrodon*. Sun-fish.

Char.—No ventral fins; jaws bony, advanced, and furnished each with two teeth.

Spec. 1. Tetr. *Testudineus*. Lin. Tortoise-billed Sun-fish. *Tetrod. perroquet*. Lacep. *Char.*—Upper-jaw more advanced than the lower; very small prickles on the belly.

The tribe called sun-fish contains 19 species, three of which are occasionally taken off the British coasts. They are remarkable for the property of inflating the belly, so as to render them more buoyant in the water. The species here selected has a beak resembling that of the hawk's bill turtle, or still more the bill of a parrot. It is found in the Indian seas. The prickles are not very apparent except when the belly is inflated, and seem intended as a sort of weapon.

Genus 13. *Pegasus*. Sea-dragon.

Char.—Ventral fins behind the pectoral; snout elongated; jaws furnished with teeth; body covered with bony plates.

Spec. 1. Pegas. *Draco*. Common Sea-dragon. *Char.*—Snout a little flattened, and without indentations; pectoral fins very large and broad.

This is another extraordinary tribe of fishes, having the pectoral fins so large and membranous that they can rise above the surface of the water, and support themselves for some time in the air. Three species are known, all natives of warm climates.

Besides the genera now described, nine others are arranged in this division: *Polyodon*, containing one species; *Ovoides*, one; *Diodon* (globe-fish) six; *Spheroides*, one; *Syngnathus* (pipe-fish) eight; *Cyclopterus* (lump-fish) 11; *Lepidogaster*, *Macrorynchus*, one; and *Centriscus*, three.

Chap. III. Bony Fishes.

Except in the circumstance of having the skeleton more solid, and consequently less flexible, the bony fishes differ from the cartilaginous in few important particulars. Their body is in general flatter, and many of them in this point resemble the rays. A vertical section across the body of a cartilaginous fish is usually circular or angular; in the bony fishes such section is more commonly oval. The skin of the latter, except in the first order, is more evidently scaly, and the fins, with the same exception, more numerous or more extended. On the other hand, it is remarkable, that fewer instances of ferocity and intelligence occur in this division, though the number of tribes and species be considerably greater, and that very few tribes have imperfect coverings for the gills. Almost all the species are truly oviparous, producing eggs that are hatched after expulsion. Considering the great number of species, it is not surprising that in this division are found most of the fishes which constitute so large a portion of the food of man.

Order 1. Apodal Fishes.

This first Linnæan order, comprehending the fishes which are destitute of ventral fins, contains twenty-eight modern genera, named by Lacepede, *Cæcilia*, *Monopteras*, *Leptocephalus*, *Gymnotus*, *Trichiurus*, *Notopterus*, *Ophisurus*, *Triurus*, *Apteronatus*, *Regalecus*, *Odontognathus*, *Murena*, *Ammodytes*, *Ophidium*, *Macrognathus*, *Xiphias*, *Anarchicas*, *Comephorus*, *Stromateus*, *Rhombus*, *Sternoptyx*, *Stylephorus*, *Murænophis*, *Gymnomuræna*, *Murænoblenna*, *Sphagebranchus*, and *Unibranchapertura*.

Genus 14. *Cæcilia*. Blind-eel.

Char.—No fins; branchial opening below the neck.

Classification.

Spec. Cæcilia *Branderiana*, Blind-eel. *Muraena Cæca*, Lin.

Lacepede has properly separated this strange fish from the eels, as it differs materially in the nature of the branchial openings, and in having fourteen other apertures on the fore, upper, and back parts of the head. It resembles the eels only in the snake-like form of the body. The only species yet discovered was found in the Mediterranean sea on the coast of Barbary, but is very little known.

Genus 15. *Gymnotus.*

Char.—No dorsal or caudal fins.

About six species are described by naturalists.

Spec. 1. Gymnotus *Electricus*. Electric Eel. *Char.*—Lower jaw advanced; numerous small apertures on the head; anal fin extending to the extremity of the tail.

Besides the torpedo, four other fishes, three of which will be here particularly noticed, possess the property of electrifying animals with which they come in contact. The electrical gymnotus appears to enjoy this property in a higher degree than the torpedo. At first sight it resembles the common eel, but is soon easily distinguished by its oval head, blunt snout, large pectoral fins, flattened belly, and blunt tail, without any proper caudal fin. It is sometimes seen three or four feet long, and ten or twelve inches in circumference. The usual colour is a dark reddish brown. The electrical organs occupy nearly a third part of the whole bulk, and are situated just below the muscles and air-bladder, on each side of the belly and tail. They are double on each side, consist of four unequal assemblages of rhomboidal membranous prisms of various sizes, having their cavities filled with an unctuous matter, and united by cross ligaments, and well supplied with nerves, by which they are connected with the muscles. As yet the animal has been found only at Surinam in South America, but it has occasionally been brought to Europe and submitted to experiment.

When a small living fish is thrown into a vessel of water containing an electrical eel, the latter swims up to it and gives it a shock, which deprives it of the power of escape. The fish struck turns on its back, and remains motionless for some time. If a person dip one hand in the water, though not very near the eel, he receives a slight concussion as from the charged conductor of an electrical machine; if he touch the fish with one hand, the concussion is more sensible; but if he apply one hand to the head and the other to the tail, he experiences a smart shock as from a charged Leyden phial. A stout man thus touching a large healthy eel has been thrown into a fit. If a number of persons form a circle, with the eel between the two extremes, all feel the shock; and a dog made to form part of the circle, has uttered a howl of terror on feeling the unusual sensation.

Genus 16. *Trichiurus.* Blade-fish.

Char.—No caudal fin; body and tail much elongated and very flat and thin; branchial openings situated very near the eyes.

Classification.

To this genus, which contains two species, belongs the third electrical fish above alluded to, viz.

Spec. 1. Trichiurus *Electricus*, Electrical Blade-fish. *Char.*—The two jaws equally advanced.

The English name given to this tribe is very expressive of the form of the body; long, narrow, and flat, like the blade of a sword. They have a long dorsal fin, a sharp snout, and a taper tail, without any fin on either edge. The electrical species is found in the Indian ocean, and the seas about the West India islands, and differs from the other species in having extremely small teeth, and being of a brown colour. Indeed, it is remarkable, that a dark lurid appearance prevails in all the three electrical fishes yet described in this treatise. The electrical organs of this species have not been accurately examined, and its habits and manners are very little known. The former are probably confined to a very limited space, and the fish seems to possess the electric property in a much lower degree than the torpedo or gymnotus.

The other species, *T. Leptura*, is very beautiful, and is distinguished by a variety of brilliant colours; but from its exerting no electric powers, some naturalists think it should be placed in a separate tribe.

Genus 17. *Muræna.* Eel.

Char.—Nostrils tubular; eyes covered with the skin.

In their general form, the eels very much resemble snakes, and for this reason are commonly viewed with disgust. Their long cylindrical body is edged along the back, and from the tip of the tail to the vent, by one continued series of fins, formed by a union of the dorsal, caudal, and anal, and is covered with a smooth slippery skin. Behind the head, or the pectoral fins, is a breathing orifice. The proper eels are now reduced to about four species, by the separation of several which have imperfect branchial coverings. Three rank as British fish, and two of them, the common eel and the conger, afford strong, if not wholesome nourishment.

Spec. 1. Muræna *Conger*. Conger Eel. *Char.*—Two rather cylindrical appendages to the upper lip; lateral line white.

The common eel is sometimes seen of considerable size, measuring five or six feet long; but the conger attains much greater dimensions, having been taken above ten feet long, 18 inches in circumference, and weighing about an hundred pounds. It differs from the common eel, in being generally darker, with larger eyes, more bones, especially about the back, and the lateral line composed of a row of numerous distinct white spots. Full grown congers never leave the salt water, but the young fish or *fry* ascend the rivers and are taken in great numbers about the carp season. They are esteemed a great delicacy, and, like the larger fish, are usually dried and exported, chiefly to Spain and Portugal, where they are powdered, and mixed with ragouts and sauces. It is said, that the large congers lose 3-4ths of their weight by drying. The conger is a very active voracious fish, and devours small fish and crustaceous insects, especially crabs, when they cast their shells. It is found in most parts of the European seas, and is frequently caught on the coast of Britain, with lines baited with pilchards, mackerel, or other small fish.

GENUS 18. *Ammodytes.* LAUNCE.

Char.—Anal fin distinct from the dorsal and caudal; head compressed, and narrower than the body; upper lip double; lower jaw narrow and pointed; body elongated.

Spec.—Ammod. *Tobianus.* Sand Eel. As only one species of launce is known, it is unnecessary to give the specific character. It is well known on the British coast, and is frequently taken in the firth of Forth, both for the table and as bait for other fish. It is extremely active, darting through the sand with great velocity when attempting to elude its pursuers, or when itself in pursuit of worms. Sand eels are considered very delicious food, but disagree with many persons from their great lusciousness.

GENUS 19. *Xiphias.* SWORD-FISH.

Char.—Upper jaw lengthened out into a long and narrow plate, equal in length to about one-third of the whole fish.

Two or three species of sword-fish are admitted by modern naturalists; but their differences are so slight that it is doubtful whether they should not be regarded as varieties. The species best known, X. *Gladius*, or Common Sword-fish, grows to a large size, some species having been seen nearly 20 feet long, with a sword extending four or five feet. This formidable weapon is merely a projection of the snout, covered with the skin, and is flattened either vertically or horizontally. It is generally grooved, but in one species the sides are flat. Although this sword be not very sharp, either on its edges or at its point, it is capable, when impelled by the full force of the animal in rapid motion, of penetrating a thick plank of wood; and though Pennant doubted this circumstance, which is related by Pliny, well authenticated instances, where a portion of it has been found sticking in the keel of a ship, are upon record, and a piece of a plank containing part of a sword-fish's snout is shewn in the British museum. At first view this fish might be mistaken for the saw-fish, which it resembles in size, and in the general form of the body; but it differs materially in the form and disposition of the fins, and in the shape of the tail. The sword-fish has one long dorsal fin, extending from head to tail, and a longer anal fin, and the tail is curved at its posterior part exactly into the figure of a crescent.

The manners of the sword-fish, too, are mild and gentle; it lives chiefly on marine vegetables, and seldom attacks other animals, except in self-defence. At these times it is bold and active, will maintain a furious combat with the more ferocious whales, and, it is said, even with the crocodile; and when thus engaged, it inflicts wounds not less terrible than the saw-fish, as its weapon though not serrated is of a much harder consistence. It inhabits almost all parts of the Atlantic, from the northern ocean to the south temperate zone. It is also found in the Mediterranean, and has sometimes been taken in the British seas. The flesh furnishes good food, and hence it is eagerly sought after, especially in Italy and Sicily, but its capture is attended with considerable danger.

GENUS 20. *Anarchicas.* WOLF-FISH.

Char.—Snout rounded; more than five conical teeth in each jaw; grinders both above and below; a long dorsal fin.

Spec. 1. Anarch. *Lupus.* Sea-wolf. *Char.*—Four maxillary bones in each jaw; teeth bony and very hard.

Of the three known species of anarchicas, the present is best known and most interesting. It inhabits the northern and German oceans, and is often taken off the British coasts. It is an ugly and a terrific animal, with a long clumsy dark-spotted body, a round blunt head, a wide mouth displaying very formidable teeth, and a short rounded tail. It is very ferocious, seizing on any thing that approaches to molest it, and bites so hard as to leave the marks of its teeth even on iron. It feeds chiefly on the marine crustacea, and easily cracks their shells with its strong jaws. This fish is said to be superior in flavour to holibut, and is generally sold under the name of cat-fish or sea-cat. It is in highest season from February to April inclusive, as it is then full of roe.

GENUS 21. *Stylephorus.*

Char.—Snout advanced, susceptible of being curved backwards by means of a membrane; mouth terminal; eyes pedunculated; three gills on each side; pectoral fins small; one dorsal fin, extending from head to tail; caudal fin short and spinous; body long and compressed.

Spec. Styleph. *Chordatus*, Shaw. S. *Argenteus*, Lacep.

This extraordinary species is here noticed as an instance of apodal fishes, which have a branchiostegous membrane without a gill cover, as well as from its very peculiar form, almost incapable of verbal description. It was first described by Dr Shaw in 1788, in the first volume of the Linnæan Transactions. The individual here noticed was taken between Cuba and Martinique, several leagues from the coast, swimming near the surface of the water. It was about two feet long, with a filament extending about a foot and a half beyond the tail; its colour was a silvery white.

ORDER II. JUGULAR FISHES.

Very few tribes and species belong to this order; but among them are several commonly used as food, especially the numerous assemblage of cod-fish and blennies. Ten genera are distinguished by Lacepede, viz. *Muraenoides, Callionymus, Calliomorus, Uranoscopus, Trachinus, Gadus, Batrachoides, Blennius, Oligopodes, and Kurtus.*

GENUS 22. *Callionymus.* DRAGONET.

Char.—Head thicker than the body; branchial openings situated on the top of the neck; ventral fins very distant from each other; body and tail covered with very minute scales.

About five species of dragonet are now admitted

Classification.

as belonging to this genus; the following is found on the coasts of Britain.

Spec. 1. Callion. *Lyra.* Common Dragonet.

Char.—First ray of the first dorsal fin equalling in length body and tail; opening of the mouth very large; caudal fin rounded.

The dragonet, so called by Pennant, has a very peculiar appearance from the great length to which the first ray of the dorsal fin extends. The whole fish seldom exceeds a foot in length, and the first dorsal ray reaches nearly to the tail. It has very large eyes, and the body is beautifully variegated with yellow, blue, and white. This fish has been taken on the Yorkshire coast, and in the Firth of Forth, and is not uncommon in the Northern Atlantic, and the German ocean.

Genus 23. *Gadus.* Cod-fish.

Char.—Head compressed; eyes approaching each other and situated on the sides of the head; body elongated, a little compressed and covered with small scales; gill cover composed of several pieces, and edged with a smooth border.

This numerous tribe, containing at least 20 species is among the most important of the class, as it furnishes us with abundance of cheap and wholesome nutriment, including the cod, haddock, torsk, ling, whiting, burbot, and many other eatable fish. The species are gregarious, and are confined chiefly to the northern and more temperate regions of the sea.

Species 1. Gadus *Morhua.* Common Cod. *Char.*—Three dorsal fins; tendrils at the end of the snout; caudal fin cleft; upper jaw more advanced than the lower; first ray of the foremost anal fin without joints and spines.

The cod grows to the greatest size in the Northern ocean and about Newfoundland, where it is sometimes taken near six feet in length and five in circumference, and weighing above 75 lbs.; but in our seas it seldom exceeds three feet, and weighs from 14 to 40 lbs. The middle-sized fish are generally preferred, and they should be chosen with the body and tail thick in proportion to the length, the skin dark, and the flesh firm. The full grown fish are best during winter when the female is full of roe, as in the spring when they spawn they grow lank and flabby; but the young fish or codlins are in season throughout the summer. It is usual to keep cod in salt for a day or two before dressing it, and by this practice the flesh is rendered firmer but less delicate, and in particular the glutinous parts about the head lose their fine flavour; but codlins are much improved by being salted about 24 hours. This species lives chiefly on small fish, worms, crustaceous insects, and shell-fish; and its digestion is so powerful as nearly to dissolve the smaller shells. It is very voracious, and catches at any small body moving near it, or which may be thrown in its way. Hence it is easily taken by the methods described under fisheries. Few fish are more prolific; above 9,000,000 of eggs having been computed in the roe of a cod of middling size. Indeed, were not this the case, the species would be soon extirpated, as both the eggs when extruded and the young fry are eagerly sought after by a great variety of fishes.

Classification.

Spec. 2. Gad. *Æglefinus.* Haddock. *Char.*—Three dorsal fins; tendrils at the snout; tail cleft; upper jaw most advanced; colour whitish, with a black lateral line.

In its general appearance the haddock nearly resembles the cod, so as often to be mistaken for a codlin, but it is easily distinguished by its lighter colour, its black lateral line, and by a black oblong spot on each side of the back just below the first dorsal fin. It is also much smaller than the cod, and seldom weighs 14 lbs. Large haddocks are generally thought very coarse food; and the middle sized, provided they be thick and short, are preferred. This species inhabits the same regions with the cod, and in our seas is generally more abundant. It is in highest season from November to January inclusive, and during the latter part of May, as it spawns in the interval between January and May, and quits our coasts during the summer when the herrings begin to make their appearance. Like the cod, the young fish fit for frying continue pretty good through the greatest part of the year. It is asserted by the fishermen, that in stormy weather the haddocks retire to the bottom, and shelter themselves among the sand till the storm be over; and they say that they seldom take these fish in rough weather, and after a storm they are generally dirty. The remarkable black marks on the back of the haddock, resembling the impression of a thumb and finger, have led the vulgar to suppose that this is the fish out of whose mouth St Peter took the tribute money demanded of his Lord.

Spec. 3. Gad. *Callarias.* Torsk. *Char.*—Three dorsal fins; tendrils at the snout; tail crescent-shape; upper jaw most advanced; lateral line broad and spotted.

Spec. 4. Gad. *Molva.* Ling. *Char.*—Two dorsal fins; tendrils at the snout; tail rounded; upper jaw most advanced.

Two species of the gadus tribe are usually sold in a dried state for the table, under the name of hard-fish, which differ from each other both in shape and quality, though apt to be confounded. The torsk is reckoned the more delicate of the two, and is smaller and proportionably broader than the ling; in its recent state it seldom exceeds 30 inches in length, and when dried is scarcely ever found so long, while the ling sometimes grows to the length of seven feet, and is commonly seen three or four feet long and very narrow. Both are taken in the Northern ocean, and occasionally, especially the ling, in the British seas; but the Torsk seldom advances to the south of the Orkney isles, though the ling is frequently taken on the southern coast of Scotland and on that of Yorkshire. In the dried state in which the torsk is most usually met with, both species are imported from the Baltic, and lately from the Orkney and Shetland islands; but the ling, from being more common, is often seen in our markets, and eaten fresh. The latter is in greatest perfection from February to May, and spawns in June. Its usual colour is olive or ash on the back or sides,

Classification.

with a white belly. When fresh it abounds with a rich well flavoured oil, which is exhaled in the drying, whence the dried ling is generally more insipid than the other species.

Spec. 5. Gad. *Merlangus.* Whiting. *Char.*—Three dorsal fins; no tendrils at the snout; tail crescent-shaped; upper jaw most advanced; colour white.

Like the haddock, the whiting appears periodically in vast shoals, extending for a considerable distance, a little way from land; but this species begins to make its appearance in the spring. It is a more elegant and a more delicate fish than any of the tribe, and is also one of the smallest, being seldom found of the length of 20 inches, generally not more than 10 or 12. It is common in all parts of the North sea; but is said to be largest on the Dogger-bank between England and Holland. In South Britain whitings are dried, but not split open like the species already described.

Spec. 6. Gad. *Lota.* The Burbot. *Char.*—Two dorsal fins; tendrils at the snout; tail rounded; both jaws equally advanced.

In its general appearance the burbot resembles the ling, but is much smaller, seldom weighing more than from three to six pounds, and is farther distinguished by a very flat head and two upright tendrils on the top of the snout. It has a disgusting appearance from the dark colour and sliminess of the skin, but in delicacy for the table is esteemed little inferior to the whiting. It inhabits the Northern ocean, and is also found in some lakes, especially in the lake of Geneva, but is frequently taken in the Trent and some other British rivers.

Besides the species now described, 11 others, the dorse, the bib, the pout or whiting pout, the poor, the speckled cod, the coal-fish, the pollack, the green cod, the five-bearded cod, the three-bearded cod, the hake, are found in various parts of the British seas, and most of them are brought to market.

GENUS 24. *Blennius.* BLENNY.

Char.—Body and tail elongated and compressed; ventral fins composed of from 2 to 4 rays. This is a more numerous tribe than the former, and contains about 23 species. They differ from the cod tribe in having a blunter head, a curved or waving body, and generally a more continuous dorsal fin. They are also more active and voracious, and the skin smoother and more slimy. Some of the species are oviviparous, or hatch the eggs before they are extruded. Seven of the species, including the following, are ranked among the British fishes.

Spec. 1. Blen. *Viviparus.* Viviparous Blenny. *Char.*—Openings of the nostrils tuberculated, but not fringed; lateral line straight, anal fin united with the caudal, and composed of more than sixty rays.

Of the few bony fishes which produce perfect living young, this blenny is most easily examined and observed, as it is by no means an uncommon fish. It is found in most parts of the Northern ocean and North sea, and is frequently found on the British coasts. It is said to resemble the eel in form, but is shorter and thicker, though equally slimy and active. It is about a foot long, of a yellowish brown colour, spotted with black on the back and dorsal fin, and a dirty white on the belly. It is remarkable, that while the oviparous fishes seek the coasts and rivers when about to spawn, this blenny and other fishes that produce their young alive, quit the shallows at such periods, and retire to the deep.

Classification.

ORDER III. THORACIC FISHES.

A great multitude of bony fishes, comprehending nearly one hundred tribes, and at least eight hundred species, belong to this order, as they agree in having the ventral fins immediately below the pectoral, whence it appears that this structure prevails among the greater number of bony fishes, though it be very uncommon among the cartilaginous tribes. From among this host of fishes, the following are selected for their interest or utility.

GENUS 25. *Scomber.* MACKEREL.

Char.—Two dorsal fins, with one or more small fins above and below the tail. Sides of the tail carinated, or a small fin composed of two spines united by a membrane before the anal fin.

Spec. 1. Scomb. *Scomber.* Common Mackerel. *Char.*---Five small fins above and below the tail; dorsal fins twelve-rayed.

This elegant fish, distinguished alike by beauty of form and brilliance of colour, in which it excels all the fishes of the north temperate zone, is gregarious, and visits the coasts of Britain in the summer and autumn. The shoals seem to steer a northerly course, as they appear much earlier, and are of much finer flavour in England than in Scotland, though it is said that when they reach the coast of Norway, they recover their delicacy, and are there both large and rich in flavour. The male fish or *milters* are generally preferred for their flesh, but the roes of the females when salted are much esteemed as caviar. To examine, and indeed to eat, this fish in perfection, it must be newly taken, for its brilliancy of colour is materially diminished though not obliterated by death, and keeping for a few hours renders it comparatively flabby and insipid. When cured by salting or pickling, in which state it is much employed abroad, these processes should be commenced as soon as possible after the fish is caught.

Mackerels are very voracious and active, flying at every thing that moves near them, tho' they are most attracted by brilliant objects, as a piece of scarlet cloth. They are extremely fond of herrings and attack them with great fierceness; they are said even to seize on a human body though alive. Pontoppidan, the Norwegian bishop, celebrated indeed for his marvellous stories, relates that a sailor belonging to a ship in one of the harbours in Norway, going into the water to wash himself, was suddenly missed by his companions. In a few minutes he was seen on the surface, with great numbers of mackerel fastenen on his body. Some of the seamen went in a boat to his assistance, and though they soon got him out of the water, and with some difficulty forced the fishes from their hold, either from terror or loss of blood he speedily expired.

The mackerel is on the whole a small fish, seldom growing above a foot long, or exceeding two pounds in weight. The female is very prolific, and deposits her eggs among the rocks. In the spring these fishes are nearly blind, in consequence of a film that grows over their eyes and separates towards summer.

Spec. 2. *Scomb. Thynnus.* Tunny or Spanish Mackerel. *Char.*—Eight or nine small fins above and below the tail; pectoral fins not reaching to the vent, but terminating below the first dorsal fin.

The tunny is a larger and proportionally a thicker fish than the mackerel; has the dorsal fins very near each other, and the first of them composed of numerous rays. The pectoral fins, though shorter than in some species of this tribe, are much longer than in the mackerel, and the lateral line, instead of being broad, straight, and interrupted, is very narrow, continuous and waved. The tail is crescent-shaped, and the colours by no means brilliant. This species sometimes grows to the length of 10 feet, and attains a considerable weight. It is found most plentifully in the Mediterranean sea, visiting successively the European and African coasts, and the principal islands, especially Sicily. It swims in shoals of an angular form with the point foremost, and the fry precede the larger fish, as if under the protection of the latter. When fresh, the flesh of the tunny has a red colour like beef, but grows pale by boiling, and has the flavour of salmon. It is much esteemed by the Sicilians and most other inhabitants of the coast of the Mediterranean. It is eaten either fresh or salted, and the most delicate parts are about the snout.

Like the mackerel, the tunny is a predacious fish, and seizes its prey with avidity.

The tunny is sometimes seen on the west coast of Scotland, and has occasionally been taken off the western coast of England.

The *scad*, an eatable fish, having the flavour of mackerel, and sometimes taken on the south-western coast of England, was formerly reckoned a species of scomber, but has lately been removed to a new genus, *Caranx*, on account of its having no spurious fins.

GENUS 26. *Echeneis.* SUCKING-FISH.

Char.—Head depressed, and covered at its top with a very large oval plate, composed of transverse folds.

Spec. 1. Echin. *Remora.* Common Sucking-fish. *Char.* Between sixteen and twenty pairs of folds in the head plate.

Three species of fish, distinguished by the epithet sucking, rank under this genus. They are remarkable for an adhesive organ similar to what is found in the feet of some reptiles, especially the geckos, (see ERPETOLOGY) by which they attach themselves to fish or other objects, either to arrest their progress, to shelter themselves from the attacks of their enemies, or to rest from fatigue. The present species is usually about a foot in length, has a long slender body, with a rounded back, and a forked or crescent formed tail. It is of a black colour above, and whitish beneath. The adhesive organ has never more than nineteen, or fewer than fifteen, transverse folds placed in a double row on each side of a middle line. It is found in most parts of the ocean, especially in the warmer regions, and has been taken on the British coast, adhering to a cod.

The sucking-fish attaches itself to the sides of sharks, turtles, and other marine animals, and when their prey is very large, several individuals combine to arrest it; five have been taken from a single shark, and they adhere so strongly, that it is almost impossible to detach them without violence; they will even stick to glass and other smooth objects. As the opening of the mouth is nearly in a line with the adhesive organ, it is probable that they derive nourishment from the fish which they attack by sucking their juices. The ancients believed that, though of such a diminutive size, these fish have the power of checking the course of a ship in full sail; and Ossian gives a beautiful poetical description of this imaginary circumstance. St Pierre, in his account of the Isle of France, relates, that formerly the natives of some of the West India islands employed the remora in fishing, as hawks are used to catch birds. They kept them in a domestic state, and on a fishing excursion carried them out to sea attached to a canoe by a long line. When a fish was seen, the remora was sent in pursuit of it to the length of his tether; and when he had attached himself, he was drawn to the boat with his game, detached from it, and sent out for more. In this way, fish of a very large size, and even turtles, too bulky for a man to lift, have been captured.

The flesh of this fish is eatable, and is said to taste like fried artichokes.

GENUS 27. *Coryphæna.*

Char.—Head very much compressed and sharp at the top, or very much raised, and terminating before either in a vertical plane or a circular arch, and covered with scales similar to those on the back. A single dorsal fin, nearly as long as the whole body and tail.

Spec. 1. Coryph. *Hippurus*, Horse-tailed C. or Dolphin. *Char.*—Dorsal fin composed of about 60 rays; branchiostegous rays of the gill-cover more than 6; more than one row of teeth in each jaw.

The coryphænae, of which 16 species are described by Lacepede, forms a very elegant tribe of fishes, generally distinguished by the beauty of their form and variety of their colour. The hippurus when full grown, is often 4 feet and a half long. The head is circular from the front of the dorsal fin to the mouth; the body is very thick at the neck, and tapers away gradually to the tail, the fin of which is forked and pretty long. The dorsal fin is very broad; the back is of a fine blueish green colour, marked with round yellow spots, and the belly of a silvery white. This is the fish commonly called the dolphin by sailors, and as its colours vary and fade after it is taken out of the water, it has been confounded with the proper dolphin described at p. 336. Besides being a very elegant fish, it is esteemed a great delicacy, and is eagerly caught by the crews of ships sailing between the tropics. The hippurus is voracious and active, and greedily pursues the triglæ and flying-fish, which constitute its favourite food. While thus employed in attacking its neighbours, it is easily taken by the sailors, and frequently it is to be seen in great numbers sporting about a ship, especially at the prow, where the officers stand ready with a hook and line, and often furnish themselves with a delicious repast.

Two other beautiful species, called the sea-peacock, and the blue-fish, as well as the preceding, are described and figured by Bloch in his elegant work on fishes.

GENUS 28. *Cottus*. BULL-HEAD.

Char.—Head longer than the body; general form rather conical; two dorsal fins; spines or tubercles on the head or gill-covers; more than three rays in the ventral fins.

Spec. 1. Cottus *Scorpio*. Sea-scorpion or Father Lasher. *Char.*—No tendrils to the lower jaw; several spines about the head; body beset with small spinous tubercles.

Spec. 2. Cot. *Quadricornis*. Four-horned Bull-head. *Char.*—No tendrils at the lower jaw. Four bony protuberances on the top of the head.

The two species here selected have a general resemblance to each other in the form of the body, tail, and fins, but differ materially about the head, which in the first is short, thick, and thorny, giving the animal a very formidable appearance, while in the second it is long, narrow, and without spines. The general colour of both is brown, and both have very broad pectoral fins. Both are found in the Greenland seas, but only the first species is common on the coast of Britain. The sea-scorpion is very active, voracious, and bold, but the other species is rather careless than audacious, and possesses the other qualities in a less degree. Both are employed as food by the Greenlanders, but the first is preferred, though seldom eaten in this country, from the disgusting appearance of the fish, and an erroneous idea arising probably from the severe wounds inflicted by its spines that it is venomous.

One other species, the common bull-head, (Cot. gobio) is common in our brooks, where it feeds on water insects.

GENUS 29. *Scorpæna*.

Char.—Head beset with spines or protuberances, or furnished with tendrils; a single dorsal fin.

Spec. 1. Scorp. *Volitans*. Flying Scorpæna. (*Gasterosteus Volitans*, Lin.) *Char.*—Pectoral fins longer than the body. Of the 16 species now ranked under this genus, the one here selected is the least disgusting in its appearance, and the most interesting in its habits. It is a fresh water fish, inhabiting the rivers of Amboyna and Japan, and is almost the only tenant of the streams that has the power of imitating the action of flying from the water, and sustaining itself for some seconds in the air, while it describes a considerable curve in its descent. It is usually about six inches long; has an ugly head, with two long tentacula, like horns on the summit; a wide mouth furnished with tendrils; a dorsal fin, with long spinous rays, like the quills of a porcupine; and a transparent tail. The body is brown; the pectoral and ventral fins dark purple, with white spots, and similar spots appear along the lateral line.

GENUS 30. *Gasterosteus*. BANSTICKLE.

Char.—One dorsal fin; spines generally separate before the dorsal fin; each side of the tail longitudinally carinated; ventral fins composed of one or two spinous rays.

Spec. 1. Gasteros. *Aculeatus*. Three spined Banstickle, or Stickleback. *Char.*—Three spines in front of the dorsal fin.

This very small fish is common in our brooks and running ditches, and when in full vigour during summer, has a very elegant appearance. The fore part of its body is broad and thick, but it tapers gradually to the tail, which is long, slender, and angular. The fins are very delicate and transparent, and the eyes large and lively; the back is usually of an olive-green colour, the throat and breast of a fine crimson, and the sides and belly a silvery white. Besides the spines on the back, there is a sharp thorn standing out perpendicularly from each side of the belly, which is further defended with bony plates. The motions of this fish are easy and elegant, and so incessant, when kept in a glass vessel with water, that it appears never to rest. In its native waters it feeds on worms, insects, and the eggs and fry of other small fishes, but may be kept alive for many weeks in clean fresh water without any other food than the animalcules it may find there. Hence, when put into a spacious glass vessel freely exposed to the air, they form a pretty ornament for a chimney-piece or side-board. They are sometimes taken in such quantities in some of the small rivulets in England, that the farmers in the neighbourhood employ them as manure.

Sometimes the sticklebacks multiply so much, especially in fenny countries, that they are compelled to send colonies into more distant waters, and it is astonishing what multitudes emigrate on these occasions. Once in every seven or eight years they appear in the river Willand, near Spalding in Lincolnshire, in such large shoals as to form a vast column in their progress up the stream. So great are their numbers, that a man employed by a farmer to catch them for manure, for some time earned four shillings a-day, by receiving at the rate of only a halfpenny per bushel for his labour. While removing from one place to another, they use extraordinary efforts and great caution to pass intervening obstacles, and, though seldom more than two inches long, they have been seen to spring to the height of a foot and a-half above the surface of the water, and much farther in an oblique direction. The manners of this diminutive fish, in a state of domestication, are very amusing. When first put into the water they generally refuse to eat, but soon become reconciled to their situation, and greedily devour small worms, or such fry as they are accustomed to live on, they even become so tame as to eat out of the hand, and sometimes grow petted and capricious, and attempt to bite or scratch a finger held near them in the water. If a fish above their own size, as a minnow, be thrown into the vessel in which they are kept, they immediately attack it, and, by tearing its fins or tail, oblige it to fly before them.

Three species of this tribe are known, and are all occasionally met with in the rivulets or seas of Britain.

GENUS 31. *Trigla.* GURNARD.

Char.—Two dorsal fins without any intervening spines; some jointed rays not united by a membrane near each of the pectoral fins.

Twelve species of this tribe are characterized by Lacepede. They agree in having a long taper body covered with scales, a large deep head, angular at the forehead, and large fins, especially the pectorals, which in some species are so broad as to enable the fish to spring, or fly, as it is called, above the surface of the water. They are generally found in the seas of warm climates, but three of them frequent the coasts of Britain. They appear in groupes in the tropical seas, and seem very friendly to each other; they are very prolific, and spawn three times a-year. Most of the tribe are esteemed delicious food.

Spec. 1. Trigla *Lyra.* The Piper. *Char.*—Pectoral fins long; upper jaw advanced and formed of two toothed lobes; nostrils tubular; tail a little crescent-shaped.

The piper is found in most parts of the Northern ocean, and is frequently taken on the south-western coast of Britain. It is a small fish seldom weighing above three pounds, and measuring above a foot in circumference near the head. The head is large, the nose divided into two broad plates, each terminating in three spines; and it has other spines above the head, eyes, gill-covers, and over the pectoral fins. The prevailing colour of the body is red, varying on the lower part with silvery spots, and the rays of which the fins are composed are of a bright yellow, so that it makes a very elegant appearance in the water; though why it was distinguished among the ancients by its trivial name is not easy to explain. It is esteemed by some people a fine flavoured fish, but others say its flesh is hard and dry. It is, however, an object of capture, and when taking is said to make a sort of whistling noise; whence the English name piper.

GENUS 32. *Mullus.* SURMULLET.

Char.—Body covered with large scales, which are easily detached; two dorsal fins; more than one tendril at the lower jaw.

Spec. 1. Mullus *Barbatus.* Red Surmullet. *Char.*—Body and tail red; without longitudinal rays; the two jaws equally advanced.

The great beauty of this fish has rendered it an object of attention and eulogy among poets and naturalists, both in ancient and modern times. In general, the brilliant colours of a fish are confined to the scales; but in this species the skin below the scales is red, and, as the scales are transparent, the colour shines through them as through a varnish, and is consequently much heightened and diversified. The fins are not less brilliant, being tinged of a golden yellow. Hence the animal makes a most elegant appearance in its native element, and may be kept alive for a short time in a glass vessel filled with recent sea water; but if the water be fresh, or the fish languid, it soon dies, and like the dolphin coryphæna, displays during its decay of life and vigour an infinite diversity of shades of red, purple, violet, blue, yellow, and white.

The Romans, in the more refined periods of the empire, when luxury and epicurism prevailed among the patricians, were extravagantly fond of this fish, not so much for its flavour and delicacy as a dish, as for its beauty of colour, and the savage delight afforded by the spectacle of its changes while expiring. It was usually valued at its weight in silver; but large fish of about five pounds were purchased at a still more enormous price. It was a fashionable ornament of their fish-ponds, and constituted one of the greatest luxuries of the table. Before being dressed, it was generally brought in a glass vessel before the company to regale them with the exhibition already described; and when their eyes could no longer enjoy the effect produced by the silent agonies of the victim, their palates were feasted with its flesh, served up with the most expensive and delicious sauces.

This species is common in the Mediterranean, and is also found in the Atlantic off the coasts of France, Spain, and Portugal. If ever taken on the British coasts it is extremely rare, and has perhaps been confounded with another species or variety, the *striped surmullet*, which, out of 14 described by naturalists, is the only certain British species.

GENUS 33. *Labrus.* WRASSE.

Char.—Upper lip extensile; no cutting teeth or grinders; gill-covers without spines or indentations; a single dorsal fin, very distant from that of the tail, far distant from the neck, and composed of rays terminating in filaments.

This is the most extensive tribe of fishes yet discovered, comprehending, according to Lacepede, 130 species; but as the characteristic differences of many of them are but slightly marked, it is probable that the number might be much reduced, and several regarded as varieties. They are remarkable for thick lips, whence the Latin name, for brilliancy of colour, large scales, and strong teeth. From the great number of species, the tribe is widely disseminated through all the watery regions of the globe, and about 10 are considered British fish. Some of them are eaten, but are not much esteemed. A few species swim in shoals, but many of them are solitary. Some have the tail forked or crescent-shaped; others have it rectilinear, rounded, or lance-shaped, and in a few species it is divided into three lobes. The two following British species belong to the second division.

Spec. 1. Labrus *Tinca.* Common Wrasse or Sea-tench. *Char.*—Fifteen spinous and eleven jointed rays in the dorsal fin; three spinous and six jointed rays in the anal fin; snout curved upwards; tail rounded.

Spec. 2. Labr. *Julis.* Rainbow Lab. or Goldsinny. *Char.*—Nine spinous and twelve jointed rays in the dorsal fin; the two fore-teeth of the upper jaw larger than the rest; tail rounded.

The first of these species is about nine inches long, the second seldom exceeds six. Both are handsome fish, but the second is peculiarly elegant from the variety of its colours. The general colour of the common wrasse is red, clouded into different shades and marked with numerous streaks of blue and yellow. In the gold-sinny there is a broad longitudinal streak indented on the edges, and of yellowish white colour on each side of the body, and commonly a narrow longitudinal blue streak below each of the former. The pectoral fins of the wrasse are of a golden yellow colour, and the iris of the eye either yellow or blue. It inhabits the clefts of rocks, and feeds chiefly on crustaceous animals, though it will seize an ordinary bait. As food it is said to be neither delicate nor wholesome. The usual habitation and manners of the gold-sinny are similar, but its flesh is held in more estimation.

Genus 34. *Sparus.* Gilt-head.

Char.—Teeth disposed in several rows; one dorsal fin; height of the body equal, or nearly equal, to its length.

This is another very extensive tribe, comprehending about a hundred species, and divided like the former according to the form of the tail. They differ from the labri not only in the great breadth of the body, but in having the lips less extensile, and the teeth more numerous. They are remarkable for the rapidity of their motions when fresh taken from the water. Some of them are used for food, but they are not much esteemed.

Species 1. *Sparus Aurata.* Common Gilt-head. *Char.*—Tail forked; 11 spinous and 14 jointed rays in the dorsal fin; three spinous and 12 jointed rays in the anal fin; six cutting teeth in each jaw.

The gilt-head has received its name from a remarkable spot of a crescent shape and golden yellow colour below each eye, whence the French call it *dorade*, and the Italians *orata*. It is further distinguished by a black spot on the tail. It is rather a large fish, often weighing ten pounds, is very common in the Mediterranean, and is sometimes taken on the British coasts. It was much prized by the Romans, especially when fed on oysters, and in the Mediterranean it is salted and exported. In the spring it ascends the rivers, and its flesh is improved by remaining some time in fresh water. It feeds on shell fish, whose shells it easily breaks with its strong teeth.

Four other species are ranked as British fishes.

Genus 35. *Perca.* Perch.

Char.—One or more spines, and one indentation on the gill-cover; either no tendril, or only one at the jaws; two dorsal fins.

The perches, of which about twelve species are described by systematic writers, form a tribe of eatable fish, interesting both from their utility and beauty, many of them being distinguished by brilliancy or variety of colour. They are remarkable for the thickness of the skin, and the hardness of the scales that cover it.

Spec. 1. Perca *Fluviatilis.* Fresh water perch. *Char.*—Tail a little crescent-shaped; fifteen rays on the first dorsal fin, fourteen in the second; two spinous and nine jointed rays in the anal fin; the two jaws equally advanced; ventral fins red.

The perch, though one of the largest of our fresh water fishes, seldom attains the weight of nine pounds. Its body is nearly as broad as long, but so flat that a vertical section of it forms a long oval. The back is marked with greenish bands, and the belly is reddish-white. It inhabits both lakes and rivers, and is a common tenant of the fish-pond. It is gregarious, and usually remains in deep water till attracted by a fly, worm, or other object of prey, which it seizes with avidity and is therefore easily catched. It is said that when an angler meets with a shoal of perch, he may continue catching as long as any remains, from the greediness or stupid pertinacity with which all follow the same bait.

Genus 36. *Chætodon.*

Char.—Body and tail much compressed; snout advanced; mouth small, with numerous slender flexible teeth; body nearly as deep as long; one dorsal fin; gill-cover without protuberances.

Of this numerous tribe, containing about 42 species, all inhabitants of warm climates, and most of them affording excellent food, the following is best known and most interesting from its peculiar manners.

Spec. 1. Chætodon *rostratus.* Beaked Ch. or Jaculator. *Char.* Nine spinous and thirty jointed rays in the dorsal fin; three spinous and twenty jointed rays in the anal; tail fin rounded; snout cylindrical, and much advanced.

Like the rest of its tribe, this species has a very elegant appearance. The body is nearly circular, and is marked on each side with three parallel black bands edged with white, while a similar band crosses the base of the head over the eyes, and a fifth surrounds the tail. There is also a large round black spot edged with white on each side at the base of the dorsal fin. The prevailing colour of the body is a very pale brown. The whole length of the fish seldom exceeds eight inches, and the snout is nearly half that length, and terminates in the mouth, which has usually a tubular form. This fish is found off the coasts and about the mouths of rivers in the Indian ocean, and feeds chiefly on small winged insects which hover about the surface of the water. The mode of securing its prey affords an example of those wonderful instincts implanted even in the lowest classes of animals. It swims gradually and slowly to within a few feet of the object it is about to attack; and when at such a distance that its singular weapon can take effect, it suddenly propels from its mouth a drop of water, which it aims so accurately at the insect as seldom to fail in bringing it down and preventing its escape. This species has sometimes been kept in a vessel of water to watch this curious method of attack. If, while it is in this situation, an insect be fastened to the edge of the vessel, or held there attached to the end of a stick, the fish is seen to dart its missiles at the object successively, and generally with unerring aim; for though the insect may be so securely fixed as not to fall, it is almost always struck. The fish on these occasions seems to have provided itself with a reservoir of water, from which, as from a magazine of balls within an air-gun, it repeatedly projects a drop to the distance of four or five feet apparently without taking in a fresh supply.

GENUS 37. *Zeus.* DOREE.

Char.--One dorsal fin, without spines in front, and terminating in long filaments.

The doree tribe was formerly more extensive than is allowed by modern naturalists, who now confine it to three species. They agree in having the body and tail much compressed laterally; teeth in both jaws; generally a row of spines on each side the dorsal fins; a vertical membrane situated transversely below the upper lip; and the body covered with very small scales. Two species have the tail forked or crescent-shaped, and the third here described has it rectilineal, and rounded without any hollow in the margin.

Spec. 1. Zeus *Faber.* John Doree. *Char.*—Thirty-two rays in the dorsal fin, and twenty-six in the anal; rays of the dorsal fin, from the second to the eighth inclusive, terminating in long filaments, with a round black spot on each side of the body.

The John Doree has gone through a strange vicissitude of character at different times. It was formerly in much esteem among the Romans, but, tho' common about the British coasts, it was neglected here as an article of food, till the celebrated comedian Quin, with his usual eccentricity and desire for new delicacies to gratify his nice palate, disdaining the vulgar prejudices which had banished this fish from British tables, first tried the experiment of the novel dish himself, and soon restored it to deserved celebrity. Although not a very hideous fish, as represented by Pennant, it certainly has not a very prepossessing appearance. The head is large, the snout projecting, the mouth small, the body nearly oval, and very flat. The dorsal and anal fins are much indented in the margin, and the colours are rather of a sombre hue. The black spots on each side of the body have occasioned this fish to become the rival of the haddock, in the honour of having been the species from whose mouth St Peter received the tribute money; and accordingly some French writers have distinguished it by the name of St Peter's fish, though other monkish legends affirm that these marks were impressed on it by the gigantic St Christopher, who, in wading through an arm of the sea, happened to encounter this fish in his progress. Dismissing these legendary superstitions, all modern epicures agree that the John Doree is a most delicious repast, and it is now established as a prevailing luxury.

GENUS 38. *Pleuronectes.* FLAT FISH.

Char.—Both eyes situated on the same side of the head.

The numerous tribe of flat fish, comprehending 29 species, are distinguished from all other fishes by the position of the eyes, added to the circumstance of having pectoral fins. What are commonly regarded as the back and belly in these fishes, are in reality the opposite *sides* of the body, as is evinced by the form of the head, the position of the mouth, and the situation of the gills. The side which answers to the back of the rays, as in the skate, is of a dark colour, but the other side is of a bluish or yellowish white. On this latter side they swim, and, being destitute of the means of altering their specific gravity, they remain at the bottom of the water on shoals or sand banks, where they bury themselves up to the head in mud or sand, to escape the observation of their enemies, and probably to surprise the worms on which chiefly they subsist. Most of the tribe are eaten, and some of them afford a repast at once wholesome and delicious. The eyes are not always on the same side; in some species they are on the right side of the head, as in the holibut, plaise, dab, flounder, and sole; while in others, as the turbot, they are on the left side.

SECT. I. *Flat Fish with the Eyes on the Right.*

Spec. 1. Pleuron. *Hippoglossus.* Holibut. *Char.*—Rays of the dorsal fin 107; those of the anal fin 82; tail crescent-shaped; colour of the right side grey or blackish.

The holibut attains a larger size than any other of the tribe, sometimes weighing 300 pounds even in the North sea, and much more off the coast of Greenland. Its body is long and rather narrow, resembling that of a ling when split open, but thicker in proportion than other flat fish. It is so voracious as sometimes to swallow the lead employed by mariners in sounding, and has been accidentally caught by this singular bait. It preys on crabs, haddocks, and even small skate. Both sides of this fish are free from spines or tubercles, and the left side is perfectly white.

As food, the holibut is inferior to many of the tribe, being very coarse when large, and having little flavour. The best parts are those attached to the large fins, but they are luscious and cloying. Moderate sized fish are often sold for turbot, for which they form but an indifferent substitute. This fish is much admired by the Greenlanders, who cut it into long slips and dry them.

Spec. 2. Pleur. *Limanda.* Dab. *Char.*—Rays of the dorsal fin 66; of the anal 61; tail fin a little crescent-shaped; scales hard and indented; lateral line commencing at the origin of the dorsal fin, taking a semicircular turn round the pectoral fin, and terminating at the caudal.

Spec. 3. Pleur. *Platessa.* Plaise. *Char.*—Rays of the dorsal fin 68; of the anal 54; tail-fin rounded; five or six eminences on the anterior part of the lateral line; scales thin and soft; right side marbled with brown and gray, and spotted with orange.

Spec. 3. Pleur. *Flexus.* Flounder. *Char.*—Rays of the dorsal fin 59; of the anal 44; tail-fin rounded; surface of the body rough, with numerous small points.

These three species are here brought together, and contrasted according to their specific characters, because they are often confounded, and sold indiscriminately for each other. Of the three, the plaise has the squarest form, and grows to the largest size, especially on the sand banks in the North sea, where they have been seen weighing 15 pounds. The flounder is the next in size and sometimes weighs six pounds, but the dab is generally very small. The dab, called in Scotland the saltwater fluke or flounder, is in most esteem, as having the finest flavour;

and the plaise though large, and therefore making a handsome appearance, is the softest and most insipid. The flounder frequents the mouths of rivers, and alone deserves the title of fresh-water, often given to the plaise.

Spec. 5. Pleur. *Solea.* Sole. *Char.*—Rays of the dorsal fin 81, of the anal 61; dorsal fin advanced to the point of the snout; upper jaw longer than the lower; tail rounded, body and tail elongated.

Of all the flat fish, the sole is the most remarkable for proportional length, and most esteemed for delicacy of flavour. In point of size it is next to the plaise, and is sometimes taken of the weight of seven pounds; but those of one or two pounds are preferred. The largest are taken on the west and south-western coasts of England; but the best flavoured are on the eastern coasts, especially off Hartlepool and Scarborough. A few are occasionally seen in the firth of Forth, but they are small and by no means common in the Edinburgh market. This species feeds on small shell-fish; and though it have no organs proper for breaking their hard coverings, the solvent power of the juices of its stomach is sufficient to soften them and digest their contents.

SECT. 2. *Flat Fish, with the Eyes on the Left.*

Spec. 6. Pleur. *Maximus,* Turbot. *Char.*—Rays of the dorsal fin 67; of the anal 46; tail rounded; left side beset with bony tubercles, broad at the base, and pointed.

The turbot, on an accurate examination, can easily be distinguished from the other species here mentioned. Its great breadth, nearly equal to its length, and tuberculated back or left side, will prevent it from being confounded with the holibut and the sole; the want of orange-coloured spots sufficiently distinguish it from the plaise; and its superior size and breadth from the dab and flounder. Next to the holibut this is the largest of the genus, and is sometimes taken of 25 or 30 pounds weight. In general, turbots are valued in proportion to their size, when it does not exceed 20 pounds; and from their delicious flavour, which some prefer to that of the sole, commonly fetch a high price. They are in season during the first half of the year, though in England soles are in repute for the first seven months, as well as in December. Holibut is best in the autumn months, and plaise and flounder in the summer.

The method of catching the principal flat fish is noticed under FISHERIES.

Besides the species now mentioned, eight others are found on various parts of the British coasts, viz. the smear dab, the variegated sole, the cyclops flounder, are uncommon, and first described in Donovan's work on British Fishes; the spotted flounder, the smooth dab, the lantern fish, the brill or pearl, and the whiff.

ORDER IV. ABDOMINAL FISHES.

Next to the preceding order, the present contains the greatest number of bony fishes, comprehending about 64 genera and 314 species. A few of the most interesting shall be here selected.

GENUS 39. *Cobitis.* LOCHE.

Char.—Head, body, and tail cylindrical; eyes situated very near the top of the head; jaws destitute of teeth, but furnished with tendrils; one dorsal fin; skin clammy, and covered with scales scarcely visible.

Spec. 1. Cobitis *Barbatula.* Bearded Loche or Groundling. *Char.*—Each ventral fin composed of fine rays; tendrils attached to the upper jaw; no spine near the eye.

Of the species of loche known to naturalists, two are found in the British fresh waters, but the present is most common, and is found in small rivers and running ditches. It accompanies the stickleback already described, near the cage, at the end of the middle walk in the Meadows in Edinburgh. The appearance of this fish is curious, but by no means prepossessing. When full grown it is about three or four inches long, with a cylindrical body and tail, and the head a little flattened from the crown to the base. The tendrils about the mouth are short; the mouth is small, and situated in the lower part of the head, like that of a skate; the eyes are small and prominent. The prevailing colour of the fish is brown, rather dark on the back, variegated with darker spots, and of a lighter hue without spots below; the fins are also spotted, and there is a dark brown streak along the throat.

This loche is justly called *groundling,* as it keeps at the bottom, and is fond of groveling in the mud or sand. Being a freshwater fish, it is easily preserved for some time in a glass vessel with sand, at the bottom of the water, and fed with small worms. It is an eatable fish, and some epicures are fond of swallowing it raw, after it has been killed in a glass of white wine. Indeed, some of them do not wait the completion of that process, but gulp it down the moment it is put into the wine. It is in season during the spring and autumn; and when fried, after being killed in white wine or milk, is esteemed a greater delicacy than almost any other species of freshwater fish.

GENUS 46. *Silurus.*

Char.—Head broad, depressed, and covered with large and hard plates, or with a viscous skin; mouth at the extremity of the snout; jaws furnished with tendrils; body thick; skin extremely slimy; one dorsal fin.

Species 1. *Silurus Electricus.* Electrical Sil. *Malapterurus Electricus,* Lacep. *Char.*—Dorsal fin of a fatty consistence, and situated very near the tail.

The *Silurus Electricus* of Linnæus has been removed from its congeners by Lacepede, and raised to the rank of a new genus, where it stands alone. As the chief motive for this change seems to be that it possesses electrical organs, a reason which would have equal weight in separating the torpedo and electrical eel from the genera in which they are still ranked, it is here suffered to remain with a specific character drawn from Lacepede's character of his genus *malapterurus.*

It is about a foot and a half long, with the head and body flattened; the eyes small and covered with a transparent membrane; and each nostril has two orifices. The general colour of the body is greyish, but about the tail are several dark spots. The fish is found chiefly in the Nile and other African rivers.

The electrical apparatus of this fish differs in several circumstances from what has already been described in the torpedo and the electrical eel. It is more extensive in its distribution, thinner and closer in its texture, and supplied with different nerves. It consists of a close but thin tissue of cellular substance resembling lard or blubber, lying between the skin and muscles, all around the body, and is supplied with large nervous branches from the eighth pair of the brain which pass through it to the muscles. In its electrical powers this fish resembles the torpedo.

About eleven other species of silurus are known, and some of them are eatable.

Genus 41. *Salmo.* Salmon.

Char.—Mouth at the extremity of the snout, and furnished with numerous strong teeth; head compressed; two dorsal fins, the second fatty and without rays, the first generally midway between the head and ventral fins; more than four branchiostegous rays in the gill-flap.

Including six species of a new genus, *osmerus*, which has, without sufficient grounds, been lately separated from the salmons, this genus contains about thirty-four species. Among them are some of the greatest delicacies of the table,—as the salmon, the trout, the charr, and the smelt. Most of the species are natives of the sea, and periodically ascend the rivers to spawn; but some are inhabitants of fresh-water lakes. They have all a long body, rather compressed, and covered with numerous small scales, generally reflecting brilliant colours, and are destitute of plates, spines, and tendrils. Nine species, including those above enumerated, are British fish.

Species 1. *Salmo Salar.* Common Salmon. *Char.*—Rays of first dorsal fin 14, of the anal 13, of each ventral 6; point of the snout more advanced than the lower jaw; tail thin, forked.

The salmon is one of the largest of the tribe, sometimes weighing upwards of 170 pounds. It is confined chiefly to the northern seas and rivers from Greenland to the coast of France, but is unknown so far south as the Mediterranean, and is most abundant off the coasts of Britain and Ireland, forming to these countries a valuable supply of nourishment and a profitable branch of commerce. It lives equally well in salt and fresh water, but regularly quits the sea in the latter end of the year, and enters the mouths of the large rivers to deposit its spawn. The number of fish which congregate on these occasions is sometimes astonishing, and the vigour and pertinacity with which they force their way up the stream and overcome the obstacles that oppose their progress are equally admirable and surprising. Intent only on the object of their journey, they spring over rocks and up cataracts with great agility. When they find themselves obstructed in their course, they swim a few paces back, and appear for some minutes to survey the obstacle before they make the spring by which it is to be surmounted. In this action, they bend their bodies into the form of a bow, so that the head and tail nearly meet; then suddenly exerting the whole force of their muscles, they dart out of the water to the height of many feet, and if they fail in their first attempt, they again retire backwards, and make a second or third leap. If they encounter shallows, they are said to turn on one side, and thus glide over the solid surface. In the river Liffey in Ireland, the waters of which are interrupted by a cataract 19 feet in perpendicular height, the salmon have been known to clear this formidable obstacle at the first leap,—and as they make their spring from some distance below the surface of the water, they must on these occasions often leap above 20 feet high. As they frequently fall back in their attempts, the inhabitants of the neighbourhood watch the opportunity to shoot them in their course, or entrap them by a contrivance when they fall back. A whimsical nobleman is said to have placed a boiling cauldron at one of these salmon leaps to receive the fish that missed their leap, and thus enjoy the singular repast of boiled salmon fresh from the water.

In this manner they gradually force their way nearly to the source of the river, and here they prepare deep holes in the sand for depositing their eggs. These are hatched in the spring, and in May the young are five or six inches long. About the middle of June, they begin to seek the salt water, whither their parents had retired some months before, having grown to the length of twelve or fifteen inches, and weighing several pounds. In July they are termed *gilses*, and are fit for the table, though less firm and savoury than the full grown salmon.

This species lives on small fish, worms, and insects, and is itself the prey of seals, porpoises, and other large fish.

Spec. 2. Sal. *Trutta*, Salmon-Trout. *Char.*—Rays of the first dorsal fin 14; of the anal 11; of each ventral 10; tail crescent-shaped; head, back, and sides marked with black spots.

Spec. 3. Sal. *Fario*, River-Trout. *Char.*—Rays of the first dorsal fin 14; of the anal 11; of the ventrals 13; tail a little cleft; sides spotted with red (and sometimes black.)

Spec. 4. Sal. *Alpinus.* Char. *Char.*—Rays of the first dorsal fin 14, of the anal 12, of the ventrals 6; tail crescent-shaped; lower jaw most advanced; sides reddish, or silvery spotted with white, and black and red spots on the lower fins. All these species are occasionally found in the same situation, especially in Loch-Leven in Kinross-shire, whence during the summer they are regularly carried to Edinburgh and the towns adjacent to the lake; but in general the salmon-trout is most common in running streams, and the char in lakes in the northern and mountainous parts of Europe. The river trout is the most common, and generally grows to the largest size, sometimes measuring about 18 inches in length, and weighing nearly 10 libs., but the salmon trout seldom equals that size, and the char is considerably smaller. The difference in the appearance of these fish, though sufficiently striking to a

Classification.

scientific naturalist, are not obvious to a casual observer, particularly in the river trout and the char, each of which presents several varieties; but in general the char has the body less taper than the other two species, and displays a greater variety of colour. The salmon-trout has a thick and short head, an ash-coloured back, and the black spots on its head and sides are encircled with brown, while the belly is white. Its flesh is white, and less delicate than that of the other species. In the river trout the general colours and spots vary in different waters, but the flesh is usually red as in the salmon. It is a very voracious fish, and readily seizes an ordinary bait. Like the salmon it seeks the sources of the rivers in the spawning season, and sometimes makes extraordinary leaps. The char is most abundant in the cold lakes on the summit of the Lapland mountains, and is also plentiful, and of superior flavour, in the lakes of Westmoreland. It is peculiarly fond of the larvæ of gnats, and other insects which are occasionally aquatic. The flesh of the finest varieties is red.

Spec. 5. Sal. *Eperlanus.* Smelt or Sparling. *Osmerus Eperlanus,* Lacep. *Char.*—Rays of the first dorsal fin 11, of the anal 17, of each ventral 8; tail forked; lower jaw curved and most advanced; head and body semi-transparent. This most delicate and fragrant species, though generally one of the smallest of the tribe, is sometimes seen a foot in length, and weighs about half a pound. Its form is beautiful, its colours lively, and its body so transparent, that the circulation of the blood may be distinguished with a tolerable microscope. The odour of this fish is strong, and very peculiar, and is sometimes compared with that of violets; though some individuals describe it as resembling the odour of fresh rushes. This scent forms a good criterion of the freshness of the smelt, as it is soon dissipated, or becomes unpleasant when the fish has been some hours out of the water. The smelt naturally inhabits the same seas with the salmon, though it keeps near the shore, and ascends the rivers in the spring to spawn; after which they return to the salt water, and are not seen till the succeeding season. They are said to have a peculiar antipathy to snow water, and will not enter a river so contaminated.

Genus 42. *Esox.* Pike.

Char.—Opening of the mouth large; throat capacious; jaws furnished with numerous teeth; snout flattened, and without tendrils; gill-cover and branchial opening very large; body and tail much elongated, compressed at the sides, and covered with hard scales; dorsal and anal fins short; the dorsal fin placed opposite the anal.

Spec. 1. Esox *Lucius.* Common Pike. *Char.*—Rays of the dorsal fin 20, of the anal 17; branchiostegous rays 15; head compressed; space between the eyes and neck raised and convex.

This tyrant of the lake and river, whose ferocious manners and voracious appetite justly entitle him to the name of *fresh-water shark,* is the largest of the inland or fresh-water fishes. In some of the lakes of Lapland it has been taken eight feet long, and in England it occasionally attains the weight of 35, or according to one account 170 pounds. When seen alive and in season its appearance is elegant, though formidable from the wide mouth and glaring eyes. The snout is sharp, the jaws flat and narrow, the body long, flattened, and linear, and the tail thick. The scales are very thick and hard, and beautifully imbricated, reflecting various and brilliant colours, green and yellow, with black spots on the posterior fins; but when the fish is languid or out of season, and after death, the green becomes gray and the yellow pale. It is very common in the British lakes, rivers, and fish-ponds, and, though full of numerous slender bones forked at one end, is much esteemed for the firmness and flavour of the flesh, which is best when baked or roasted, with a savoury stuffing. On the continent it is dried.

The pike is extremely bold and active, and will attack any animal which invades his demesne. He devours not only all the other fish that come within his reach, except, it is said, the perch, but even the young of his own species; and so insatiable is his appetite, that he has been known to depopulate a fish-pond in the course of a year. He will contend with the otter for his prey, and bite the legs of persons who wade into the water. He sometimes swallows stony or metallic bodies, and one has been caught with a watch, ribbon, and seals in his stomach. His greediness not unfrequently proves fatal to him; for though his gullet be very capacious, he sometimes seizes a fish broader than himself, and is choaked in the attempt to swallow it. He is not less remarkable for his longevity. It is well ascertained that a pike may live for 90 years; and it is reported by Gesner, that an individual was taken in Suabia in 1497, bearing a ring with the date 1230, so that it must have been nearly 270 years old. Like the lion and the eagle, the pike is a solitary animal, and always hunts alone. It spawns in March or April, and is in greatest perfection from June to November.

Spec. 2. Es. *Belone.* Gar-pike. *Char.*—Rays of the dorsal fin 20, of the anal 23; branchiostegous rays 14; dorsal and anal fins a little curved; jaws very narrow, and twice as long as the head; lower jaw a little more advanced; body and tail very slender and cylindrical.

The gar-pike, or *sea-needle,* as it is sometimes called, from its long and slender form, is common in the British seas, and affords a good substitute for mackerel, which it resembles in the colours of the skin and flavour of the fish, and precedes a little in its season. It grows to the length of three feet, and is remarkable for the back-bone turning green when boiled.

Genus 43. *Mugil.* Mullet.

Char. Lower jaw carinated on the inside; head covered with small scales; scales streaked; two dorsal fins.

Spec. 1. Mugil *Cephalus.* Common Mullet. *Char.*—Four rays in the first dorsal fin, nine in the second; three spinous and nine jointed rays in the anal fin; tail fin crescent-shaped; an indentation on each side between the eye and the mouth; two orifices to each nostril; gill-cover angular behind; a great number of straight, blackish, longitudinal streaks on each side.

To the above long character of Lacepede need only be added, that the head of the mullet has a square figure; that its back is of a dusky colour, varied with blue and green; the sides and belly of a silvery white. It is most abundant in the Black sea and the Mediterranean, but is also common on the sandy coasts of Britain. It is gregarious, and the shoals make an annual journey between the Mediterranean and Euxine, visiting successively the European, Asiatic, and African coasts. They root in the sand like swine, and are so social as to imitate the actions and motions of each other. They leap well, and when surrounded with a net often effect their escape; and if one succeed in overleaping the bound, the rest are sure to follow, like a flock of sheep through a gap or gateway. The flesh is much esteemed by the inhabitants of the Mediterranean shores and islands, but it is not now a fashionable dish at British tables. The roes are pickled and preserved in wax for winter use.

Six other species of mullet are described by naturalists, but none of them are British fish.

GENUS 44. *Exocœtus.* FLYING-FISH.

Char.—Head entirely or nearly covered with small scales; pectoral fins very broad, and so long as to reach the tail fin; ten branchiostegous rays; one dorsal fin opposite the anal.

Spec. 1. Exocœtus *Volitans.* Common Flying-fish. *Char.*—Rays of the dorsal and anal fins 14 each; of each pectoral 15 or 16; ventral small, and nearer the head than the middle of the fish.

In the course of the preceding pages several fishes have been noticed the largeness of whose pectoral fins enable them to rise for a short time above their natural element, and become momentary tenants of the air. The present species is the last of these *flying* fishes that will come under review, and it is best known of them all. In its size and general form it bears a distant resemblance to the common herring, but is flatter on the head and back, has the dorsal fin longer, and much nearer the tail, and is much more brilliant in its colours, being of a fine azure on the head, back, and sides, and a silvery whiteness on the belly, while the pectoral, dorsal, and caudal fins are of a deep blue. The scales are large and hard, but easily detached. The sides are marked with two lateral lines each, and the divisions of the tail fin are unequal. The pectoral fins are remarkably large and long, and are placed just behind the gill-covers, and so high on the sides of the fish as to have a considerable effect in preserving its equilibrium when darting through the air. The eyes are very prominent, and give the fish an extensive field of vision. It is found in the European and American seas, and the Indian ocean, and a single instance is recorded of its being seen in the river Tovy, in Caermarthenshire, in 1765. It swims and flies in shoals, and frequently falls on the decks of ships sailing in the tropical seas. Its flesh is delicious, and is eagerly sought after by many fish and birds of prey.

Many eloquent reflections have been made on the privileges and calamities of the flying fish. Lacepede describes it as one of the most miserable inhabitants of the waters. "Continually restless and agitated, pursued by mackerel, coryphenæ, and other fish, if to escape them it abandon its native element, and rising into the atmosphere describe there a curve more or less extensive, it finds in its descent some new enemy, by whose murderous teeth it is seized, torn to pieces, and devoured; or else, in its short passage through the air, it becomes the prey of tropic birds and other carnivorous species that infest the surface of the ocean, and, observing it from the clouds, pounce on it with the rapidity of lightning. If it fly for safety to the deck of an approaching vessel, the delicate flavour of its flesh deprives it of that asylum, and it soon meets from the greedy crew the death which it was attempting to avoid. Nay, as if every thing that bears a relation to this animal, in appearance so privileged, in reality so degraded, served but to register the unhappiness of its condition, even astronomers, in placing its image among the constellations, have set beside it that of the gilt-head, one of its most formidable enemies."

GENUS 45. *Clupea.* HERRING.

Char.—Jaws furnished with teeth; more than three rays in the branchiostegous membrane. One dorsal fin; belly carinated, with a sharp or indented edge.

Among the 17 species which constitute this genus, are found, besides the common herring, the shad, the sprat, well-known British fish, and the anchovy, so much esteemed as a sauce or condiment. They are gregarious and migratory fish, appearing in vast shoals at certain periods, and changing their abode according to the season. They contribute largely towards the support of man, and, being exceedingly prolific, furnish an abundant supply of nourishment to the larger fishes and other marine animals. All the species but one, found between the tropics, have the tail fin forked or crescent-shaped.

Spec. 1. Clupea *Harengus.* Common Herring. *Char.*—Rays of the dorsal fin 18, of the anal 17, of each ventral 9; tail fin forked; lower jaw most advanced; a triangular appendage near each ventral fin.

To describe a fish so well known is unnecessary, but it may be remarked that it varies much in size and quality at different seasons and on different coasts. It seldom exceeds a foot in length, or weighs more than half a pound, though it is occasionally seen of larger dimensions. Its flavour depends much on the quantity of oil with which the flesh is impregnated; and as the herrings taken on the western coast of Britain are the largest and fattest, they are most esteemed. They are of course best when full of roe, and the flesh of the males or *milters* is generally preferred, though the hard roe of the female is superior to the milt. A *shotten* herring, or one that has lost its roe, is flabby and insipid. No fish requires sooner to be dressed or cured than the herring. It dies immediately on being taken out of the water, and very soon loses its flavour and becomes tainted, especially if exposed to the rays of the sun. They are in greatest perfection in this country during the latter half of the year, though sometimes small herrings of pretty good quality are procured in the spring.

It is uncertain whither the remnant of the vast shoals of herring that annually appear in the German ocean and Irish sea retire on leaving those situations; and the commonly received notion of their migrating towards the polar regions has been ably controverted.—See FISHERIES. It is probable, that after spawning they seek an asylum from their numerous enemies in the depths of the Atlantic ocean, and are followed to the same retreat by such of their progeny as have escaped similar devastation. They emerge from their hidden recesses about June, and pour into the seas already mentioned in countless multitudes, furnishing a profitable employment to thousands, and wholesome subsistence to millions of the human race. The limits between which herrings are usually seen in the European seas, are very narrow, being confined between the 50th and 60th degree of north latitude, so that they are nearly confined to the British islands; but in the American seas, they appear to extend farther to the south. They feed on small crustaceous insects and the fry of other fishes, and even of their own species. In their progress towards the shore they are pursued by whales, porpoises, seals, and water birds, but the havoc made among them by these animals is trifling when compared with their destruction by man; but yet so prolific is the race, that though this fishery has been carried on in the British seas for at least 200 years, the supply continues adequate to the demand. Indeed, were it not for this salutary diminution of their numbers, the herring tribe would in a short time multiply to such a degree as to fill the waters of the ocean, and even inundate the land; for it is computed that if the progeny of a single herring were suffered to increase without molestation for twenty years they would occupy a space equal to ten times the bulk of the whole earth. As it is, they sometimes enter the inlets of the sea called lochs on the western coasts of Scotland, in such amazing columns as literally to fill the bed of the inlet, and cover its banks for above two miles, impelling before them other fish, as skates and flounders, which naturally reside at the bottom. They have been taken in such abundance that hands and salt were wanting to preserve them, and thousands of barrels have been boiled down to extract their oil, or employed as manure for the fields.

Spec. 2. Clup. *Encrasicolus.* Anchovy. *Char.*—Rays of the dorsal fin 14, of the anal 18, of each ventral 7; tail fin forked; upper jaw most advanced.

The anchovy is considerably smaller than the herring, and has a longer and more slender form. In colour it resembles the sprat or garvy, but is infinitely superior in flavour. Its body is semi-transparent, and when boiled even the backbone dissolves in water. It is found most plentifully in the Mediterranean, but has also been met with on several parts of the British coast, as in the estuary of the Dee below Chester, on the coast of Flintshire, and on that of Hampshire. Anchovy sauce was common among the Romans.

GENUS 46. *Clupanadon.* PILCHARD.

Char.—More than three rays in the branchiostegous membrane; belly carinated; with a very sharp or indented edge; anal fin distinct from that of the tail; one dorsal fin; jaws destitute of teeth.

Species 1. Clupanad. *Pilchardus.* Common Pilchard. *Char.*—Rays of the dorsal and of the anal fins 18, of each ventral 8; branchiostegous rays 8; tail fin forked; upper jaw most advanced, pointed, and curved upwards; dorsal fin situated above the centre of gravity of the fish.

The pilchard was formerly considered either a variety of the herring or a species of the same tribe; but as it differs from that fish in several important particulars, and more especially in the want of teeth, it has lately been removed to another genus with five more species. In size it is generally smaller than the herring, has the body proportionally narrower but thicker about the back, the snout shorter, the dorsal fin more in the middle of the back and a little hollowed at its posterior margin, and the scales more permanent. Its places of resort, too, are essentially different from those of the herring, for as the latter are almost never, in this country, found below 50° of north latitude, the former is scarcely seen in a higher latitude, being almost entirely confined to that part of the Atlantic which waters the shores of Cornwall and South Wales. There they annually appear in vast shoals, and, like the herring, become an extensive object of fishery and commerce.—See FISHERIES. In flavour the pilchard resembles the herring, but its flesh is fatter, and affords, on boiling or pressing, a considerable quantity of oil.

GENUS 47. *Cyprinus.* CARP.

Char.—Not more than four rays in the branchiostegous membrane; jaws destitute of teeth; one dorsal fin.

The carp tribe constitutes another extensive groupe of fishes, containing about 70 species, among which are some of the most important British fresh-water fish, especially the carp, the tench, the bleak, the bream, the gudgeon, the minnow, and the gold-fish.

Spec. 1. Cyprinus *Carpio.* Common Carp. *Char.*—Four tendrils at the snout; rays of the dorsal fin, 24, of the anal and of each ventral 9; tail fin forked; third ray of the dorsal and the anal fins denticulated.

From the largeness of its size, delicacy of its flavour, and its great prolification, the carp is the most valuable of all our fresh-water fish. In this country it not unfrequently attains the length of four feet, and weighs above 30 lbs., but in its native waters of the east, especially of Persia, from which it was originally brought to Britain above 300 years ago, it has been seen of the weight of 200 lbs. Its body is long and thick; the back and sides are of a bluish green, shaded with yellow, the belly is of a silvery white, with blackish stains on its upper part, and the tail is sometimes of a yellow, and sometimes of a violet hue. In flavour it exceeds all the fresh-water fishes, except perhaps the char. It is remarkable for the largeness of its roe, which is often found to weigh more than the rest of the fish, and contains a prodigious number of eggs, so that a pond or lake may be speedily stocked with carp, provided its great enemy the pike be excluded.

The manners of this fish are very interesting, and it is remarkable for its longevity and tenacity of life. It is easily domesticated and rendered familiar, so as to obey a signal, and come in shoals to the edge of the water to be fed. It will even suffer itself to be handled and taken out of the water, a change which it bears better than most other fish. When unmolested, it has been known to live 130 years, and is so little injured by being removed from its natural element, that if suspended in a net occasionally emmersed in water, and regularly fed, it will not only live above a fortnight, but even grow fat and improve in flavour. It is esteemed a very cunning fish, so as sometimes to be called the *river fox*.

It is remarkable that, though so common in the English fish-ponds, the carp will scarcely breed in Scotland. On the continent the breeding of carp forms a profitable speculation, and from its sound a kind of fish-glue is obtained.

Spec. 2. Cyprin. *Tinca*. The Tench. *Char.*—Two tendrils at the snout; rays of the dorsal fins 12; of the anal 11; of each ventral 9; fins thick, and nearly opaque; both jaws nearly equal in length; scales of the body and tail very small.

The tench is considerably smaller than the carp, seldom weighing more than four or five lbs. Its body is very thick and broad in proportion to its length; the back arched, the fins rounded at the tip, and the tail broad and a little crescent-shaped. The prevailing colour is dusky, but the head, sides, and belly are greenish, mixed with gold. Its skin is remarkably slimy. In delicacy of flavour this species is second to the carp, and like that fish is much admired in the form of stew. In its habits it is remarkably stupid, is easily caught, and prefers still waters to running streams.

Spec. 3. Cyprin. *Auratus*. Gold Fish. *Char.*—No tendrils at the snout; rays of the dorsal fin 20; of the anal and each ventral 9; two orifices to each nostril; gill-cover composed of two pieces; scales large; lateral lines straight.

This beautiful and brilliant species, originally brought from China, has been naturalised, and nearly domesticated in Britain for about 130 years, and now breeds in the English fish-ponds almost as readily as the common carp. It is also commonly kept in glass or china vessels as an ornament of the drawing-room. When in a favourable situation and a warm climate it grows to a considerable size, as large as our common herring; but it is seldom seen exceeding a few inches in length. In general form, it very much resembles the carp, except that its dorsal and anal fins approach nearer the tail, that its body is rather deeper from back to belly, the tail rather crescent-shaped than forked, and the snout destitute of tendrils. The colours are brilliant and varied, but the general and predominant hue is a deep gold of the greatest splendour, sometimes shaded with blue, brown, and silvery white. They are very active and lively, continually swimming about and varying their position, and catching at crumbs of bread, or other food thrown upon the water. They are also very tame, and readily approach the hand that is accustomed to feed them.

On no fish has art produced a greater variety of form and colour than in this species; not only the general shape, but the number of fins and the form of the tail have been altered by domestication. The variety represented at Fig. 14. Plate 106. has no dorsal fin, and the tail is composed of three lobes, and another variety, ranked as a species by Lacepede, has the tail four cleft.

PART II. OF THE STRUCTURE AND FUNCTIONS OF FISHES.

Although fishes, in the most limited acceptation of the term, form the lowest class of vertebral animals, they possess a very complicated structure, and enjoy a great variety of functions. Their motions are not confined to swimming; some of their senses are very acute; they have a perfect though seldom a double heart; and their respiration, though generally carried on by very different organs from those of other vertebral animals, is well adapted to the element they inhabit. On the other hand, they have no proper voice, though some of them utter sounds; their sensations are fewer and generally less important than in many other animals; their reproduction generally simple, and their tenacity of life very feeble.

Chap. I. Of the Motive Organs and Motions of Fishes.

Before describing the proper motive organs of fishes, it is necessary to make some remarks on the structure of their skeleton, which furnishes support to those organs, and forms the articulations and the sides of the principal cavities.

The solid parts of fishes differ essentially in each of the three divisions under which they are here arranged. In the *cetaceous* fishes they are very hard, though their intimate texture be so loose, that the bony fibres are readily distinguished. The several pieces of the spine are joined together in this first division much in the same manner as in quadrupeds, except that they have not so many processes. On examining the several parts of the skeleton, it is observed that the neck is short, and some of the seven pieces of which it is composed in quadrupeds are here generally grown together; that the ribs are large and fibrous, varying in number from 8 to 18; that the head is often large and composed of solid bones, though the cavity for containing the brain is proportionally small; and that the number of joints between the ribs and the division of the tail are very numerous, though, from the want of those bones which in quadrupeds constitute the *pelvis* or basin, a deficiency common to all fishes, the distinction between the joints of the loins and of the tail is not well marked.

The differences of the solid parts in the *cartilaginous* and *bony* fishes, consist chiefly in the comparative softness of the spine, the closer union of the joints of the back-bone, and the small number or intimate connexion of the bones of the head in the former. The cartilaginous fishes, too, can scarcely be said to possess ribs, while in the bony fishes they are very conspicuous though short. The structure of the spine in both these divisions is peculiar. The vertebræ or joints have very few processes, and the body of each forms a short cylinder with a conical excavation at each end, so that when joined each pair contains between them a cavity resembling two cones placed base to base, and, in the recent state, filled with a soft cartilaginous matter, which dissolves in boiling. This structure greatly facilitates the motion of the several pieces on each other, like the ball and socket joint in machinery. The number of joints in the spine varies much in different fishes, according to the form of the fish. It is generally greatest in the long fishes; the eel having about 100, and some species of shark 200 pieces between the head and the tail fin.

The skull of a fish is commonly very large in proportion to the body, and being covered only with skin, its shape is easily determined without dissection. In the bony fishes it consists of a great number of pieces; thus, in the perch, 80 have been counted. Besides those parts of the skeleton which are connected by articulation, and the solid part of the fins, to be presently noticed, many fishes have loose bones or cartilages among the flesh, and in some species, as the pike, they are forked.

The *muscles*, or flesh of fishes, by means of which their motions are immediately performed, vary in texture and colour in the several divisions and species. In the *cetaceous* kinds they are hard, firm, tendinous, and of a dark red colour, like the flesh of beef, but in the other divisions they are generally tender, composed of numerous flakes or layers without tendons, and either white or of a pale red colour.

The *peculiar organs* of motion are chiefly the *fins* and *tail*.

Fins.—The names and relative position of the fins have been already noticed, and it now remains to describe their structure and uses. Two kinds of fins are found among the *cetaceous* fishes, the pectoral, common to all the species, and the dorsal, wanting in many. The pectoral in these tribes, as in all other fishes, are always two in number, and generally situated behind or before the eyes on each side of the breast, but the structure is very different from that of the same organs in the cartilaginous and bony fishes. Indeed they nearly resemble the fore-feet of seals and walruses, being composed within of several rows of solid bones articulated together, and connected to the body by a shoulder-blade. In this member are bones corresponding to the shoulder-bone, fore-arm, wrist, and toes of quadrupeds, and they are covered with flesh, fatty membrane, and skin, so as to conceal the internal structure. As they are very different from the pectoral fins of other fishes, they have not improperly been called swimming paws. The dorsal fin of cetaceous fishes also differs in structure from the same organ in other fishes, being composed chiefly of gristle, fatty matter, and thick skin, without any appearance of bony rays.

In the cartilaginous and bony fishes the fins are generally composed of several gristly or bony pieces termed rays, as they proceed from one common cartilage or bone, and expand from each other like the sticks of a fan. Some of them are single, and commonly terminate in a sharp point or spine, while others are composed of several joints, and are called articulated rays. Of all the fins in these fishes, the pectoral and ventral are the most complex in the structure of that part by which they are connected with the skeleton or the body. They are usually two in number each, and are placed symmetrically on both sides of the body; the pectoral a little behind the opening to the gills, the ventral in various positions between the pectoral and anal fins, but always opposite and parallel to each other. The pectoral fins are articulated with the spine, by means of a cartilaginous or bony arch, and a similar structure prevails in the central fins of jugular and thoracic fishes, where the bones that support the rays are connected with the arch of the pectoral fins; but in the abdominal fish the supporting bones of the ventrals are connected with the spine only through the medium of muscles and ligaments. The dorsal and anal fins are connected with the body in this last manner, each ray having a bony process that perforates the flesh, and enters between the transverse processes of the back-bone. A familiar instance of this structure may be seen in picking a flounder.

The *tail* is a very important organ of motion, and in the larger species a formidable offensive weapon. In the *cetaceous* tribes it is placed horizontally,—is composed of bones and two layers of muscular fibres covered with fat and skin, and terminates in two fleshy lobes, without bony joints or rays. The body of the tail in the other fishes has a structure similar to the former, but its position and termination are very different. It is placed vertically and ends in a fin, the rays of which are articulated with the last joint of the spine, which is usually of a triangular form.

The *motions* of fishes consist chiefly in swimming, leaping, and climbing. Swimming is performed by means of the fins and tail. The pectoral fins striking the water in the usual manner of oars, impel the fish forwards or backwards according as they are moved in the contrary direction; while the vertical tail fin, flapping the water from side to side, materially increases the progressive motion *forward*, just as a single oar, moved with its blade vertically at the stern of a boat, aids the ordinary action of rowing. The ventral fins assist the pectoral and help to steady the motion, while the dorsal and anal fins serve chiefly to preserve the body in a vertical position. When a fish is required to alter the direction of its course, it moves the pectoral and ventral fins of that side towards which it is to incline, at the same time moving the tail chiefly in the opposite direction. The progressive motion of cetaceous fishes is effected entirely by the pectoral fins, the dorsal when present keeping the body steady, and the tail, by flapping upwards or downwards, facilitating the descent or ascent of the animal in the water. But in the other fishes these latter motions are produced almost entirely by means of a peculiar internal organ, which, being intimately connected with the function of motion, shall be here considered.

The *air-bag*, swimming bladder, or sound, found in the greater number of cartilaginous and bony fishes, is a hollow, membranous, and perhaps muscular bag, situated within the belly, close to the spine, to which it is attached. It is of various forms in different species, and its cavity is in some fishes entirely single and uniform, in others divided into several irregular cells communicating together. In the living fish it is always full of air resembling azotic gas, which is probably secreted by certain glands within the cavity. As the membrane that forms the sides of this vessel is very dilatable and elastic, and is easily acted on by the contiguous muscles, the included air is susceptible of different degrees of density. In proportion as the bag is compressed by the muscles, aided, as is supposed, by the contraction of its own fibres, the included air is rendered denser, and consequently the specific gravity of the whole body being increased, the fish sinks in the water; but when, on the other hand, the pressure of the muscles is taken off and the fibres of the bag relaxed, the air expands and becomes rarer, so that the fish is rendered specifically lighter, and rises towards the surface. The air-bag generally communicates by a particular pipe or duct with the stomach or gullet, so that it is probable when the air is too much accumulated part of it escapes by that channel.

Leaping, in fishes, is effected by a strong and sudden contraction and subsequent relaxation of the muscles of the body, aided by a sudden impulse of the tail against the water. The motion commonly called flying in these animals, is nothing more than an extended leap; though it is supposed that the large pectoral fins seen in flying fish, materially contribute in increasing the extent of the leap by striking against the air, as when these fish fall the pectoral fins are observed to be dry and collapsed.

Climbing is a very rare motion in fishes, and has as yet been observed only in one species, thence called the climbing perch. This fish has the property of raising itself several feet along the surface of a solid object, chiefly by means of its ventral fins and certain spines attached to its gill-covers and dorsal fin.

CHAP. II. OF SENSATION AND THE INSTINCTS OF FISHES.

The organs of sensation in fishes are generally much less perfect than those of the higher classes of vertebral animals. The brain of cartilaginous and bony fishes is very small, and by no means fills the cavity of the skull. It consists of several tubercles, disposed in pairs, and of these parts five, corresponding to the principal portions of the brain of quadrupeds, are most conspicuous. In most fishes the spinal marrow is proportionally small, and in the two latter divisions of this class it is not contained in a bony canal, but runs above the spine. In the cetaceous fishes, the structure of the nervous system is very different. The brain, though small, is nearly as perfect as that of quadrupeds, and is of a much firmer texture than in other fishes, and the spinal marrow is contained within a continuous canal, perforating through the spine.

The nerves of the *cetacea* have little peculiar, except that one pair, the olfactory, or nerves of smelling, are wanting. In the other fishes the nerves are proportioned to the size of the body, and the optic nerves evidently cross each other.

External senses.—It is extremely difficult to ascertain, with any degree of precision, how far fishes enjoy several of the external senses, though it be probable that most fishes possess them all in a certain degree. The cetaceous fishes probably want the sense of smelling, and the other tribes appear in general to have little pretensions to feeling; but all the species, with the exception of one or two, possess the faculty of sight, most of them that of hearing, and probably also that of tasting.

Feeling.—The skin of fishes, though an important covering, seems not to possess much sensibility. A few species, when tamed, have appeared to enjoy the operation of tickling; and many have thick lips, or are provided with tendrils, which are doubtless their principal organs of touch.

Tasting.—As most fishes, not excepting the cetaceous, swallow their food whole; as the tongue, though often large and fleshy, is generally destitute of nervous *papillæ*; and since these animals shew little discrimination in the selection of their aliment, it has been concluded, perhaps too hastily, that they are very deficient in the sense of tasting, and that the tongue is rather an organ subservient to swallowing. But this conclusion rests on conjecture, and it is not likely that these animals, which seem to have so few enjoyments, should have been left without the faculty of relishing the taste of what they swallow.

Smelling.—How far the want of the olfactory nerves deprives cetaceous fishes of the faculty of distinguishing odours is uncertain, as this deficiency may be supplied by branches from the fifth pair; it is evident, from the complicated structure of the snout and nostrils, and the fact, that some fishes are attracted by the smell of odoriferous oils, that many, if not most of the other fishes, possess the sense of smelling. In them the nostrils are often double at the external opening, sometimes provided there with muscular fibres, often prolonged outwards into a tubular form, lined with an extensive mucous membrane, and supplied with nervous branches from medullary tubercles, so large as to have been mistaken for lobes of the brain.

Hearing.—No fish possesses external ears, though the *cetacea*, and some of the cartilaginous fishes, have external openings communicating with the interior of the hearing organ; but this latter is well adapted to the reception of impressions from sounds propagated through so good a conductor as water. In the cetaceous tribes it is nearly as complex as in quadrupeds, displaying a *tympanum* with articulated bones, a labyrinth with semicircular canals and *cochlea*, and a capacious eustachian tube, and all the bony parts are extremely hard. In some of the cartilaginous fishes the cavity of the internal ear is hollowed out in the skull, and the contained bones are pretty hard; but in the bony fishes it is detached from the skull on each side, shewing semicircular canals, with small loose membranous canals, and solid bodies of an oblong form, resembling porcelain, and very brittle. These bodies are often taken from the heads of cod and haddocks, and used to represent the petals of jasmine in shell work.

The hearing of fishes is probably not very acute; but in a domesticated state, carp and other fresh water fish will obey the signal of a whistle, or the sound of a bell, when summoned to be fed.

Seeing is the most perfect sense in fishes and the structure of the eye in this class is very curious and instructive. The eyes are always two in number, but are variously situated in different tribes and species. In most cases they are on opposite sides of the head, near the nostrils, and generally at a considerable distance from each other, so as to command separate fields of vision; but sometimes they are seen, as in the flat fish, occupying the same side, or they are placed very near each other at the top of the head. The orbits in which the eyes are lodged are usually very large in proportion to the eye-ball. In the cetaceous fish the eye-ball is commonly small when compared with the body, and its structure nearly resembles that in man and quadrupeds, except that the outer coats are much thicker and more vascular, that the crystalline lens is nearly spherical, and that it has no lachrymal glands or ducts. In those tribes the eyes are defended by thick fatty eyelids, while in the other fishes these veils are either entirely wanting, or their place is partially supplied by a small fold of the skin; or, lastly, they are altogether covered by this integument, as in the eel. The eyes of these fishes differ from the former, in having a smaller proportion of aqueous humour, the vitreous humour more fluid, the crystalline more inflammable, and the whole eye more vascular. In a few species, as the rays and sharks, the eyes are pedunculated, or placed on cartilaginous foot-stalks. The pupil of a fish's eye is generally either circular or oval, but in a few instances it is angular.

The quickness and accuracy of sight in fishes are very remarkable. They perceive the approach of their prey or of an enemy in a moment, avoid the latter with great alacrity, or dart on the former with precision. The great convexity of their crystalline lens propably enables them to distinguish very small objects, but the same structure should prevent them from seeing to any considerable distance.

The internal faculties, and *instincts* of fishes, are most remarkable in the cetaceous tribes; though most of the class display judgment in the selection of food and in preferring particular baits, foresight in seeking shelter from an approaching storm, and providing a proper situation for their eggs, and a relish or distaste for the society of their species according as such association may be favourable or adverse to their interests: and domesticated fishes shew a degree of memory in daily repairing to the same spot to be fed. Proofs of the ferocity, cunning, faculty of imitation, and other propensities of particular fishes, have been given in the course of this treatise. But no instance of parental affection or attachment has appeared, except among the *cetacea*, the females of which tend and protect their young with the utmost care. But, on the whole, comparing fishes with many other classes of animals, they must be pronounced a stupid race of beings.

Chap. III. Of Digestion in Fishes.

The organs subservient to the nourishment of fishes, comprehend those of *prehension*, *deglutition*, and *solution*; the mouth, jaws, and teeth, chiefly constituting the first; the tongue and gullet, the second; and the stomach and intestines, the third.

The mouth is much varied in form, situation, and extent. It is generally, when closed, a transverse slit between the jaws, and when open is either round or oval; sometimes it is prolonged into a tube with a small external opening. In the cetaceous and most bony fishes it is terminal at the snout, but in many of the cartilaginous species it extends across the base of the head, at some distance from the snout. In some species, as most of the *cetacea*, the sharks, the fishing frogs, the pike, it is very capacious; while in others, as the sturgeon, the chetodons, and the sun-fish, it is as remarkably small. The lips are seldom regular. Sometimes they surround the mouth, are thick, fleshy, and capable of extension and contraction, but they are often of a solid texture like the beak of birds and turtles.

The *jaws* vary in figure according to the shape of the snout, and the position of the mouth. In most cetaceous and in other fishes of a long form, they are generally long and more or less pointed at the snout, while their sides often form an arch convex externally, but in many tribes they are short and rounded in front. They are seldom of equal length, either the lower or the upper projecting beyond the other. The lower jaw is always moveable.

Teeth.—Many fish are destitute of teeth, while others have a prodigious number. Of the *cetacea*, only the cachalots, including three tribes of Lacepede, the dolphins, including two, and the butskopff, have proper teeth; for the horns or tusks of the narwhals and anarnak, must be regarded as weapons rather than organs of prehension or mastication. In general the teeth of fishes are hard and solid, more or less pointed, and formed for cutting and penetrating, but in some cases they are soft and pliable. They are sometimes inserted only in one or both of the jaws, sometimes in the lips, the palate, the tongue, or the throat, and in a few instances in all these situations at the same time. Though not properly organs of mastication, they are sometimes, as in the wolf-fish, so hard and strong as to break the shells of the tectaceous animals before they are swallowed.

Whalebone.—In the balænæ and balænopteræ the want of teeth as organs of prehension is supplied by the horny substance called *whalebone*, the structure and arrangement of which are very curious. The bony arch of the palate in those whales is formed of two parts, meeting in a middle ridge, and, except that each side is concave, resembling the roof of a house reversed. Across each division of this double arch extend the plates of whalebone in a vertical position and parallel to each other, to the number of 200 or 300 on each side, and in large whales extending ten feet from the middle to the sides. The upper edge of these plates is very thick, and is united to the palate by means of a ligamentous substance; but, as they descend towards the tongue, they become gradually thinner, and terminate in a sharp edge fringed with hair. This apparatus is well calculated to entangle and retain the molluscous animals on which the whales of those tribes feed; and as the plates are exceedingly elastic and flexible, they are readily thrust back by the tongue in the act of swallowing.

The *tongue* of cetaceous fishes is generally very large, muscular, and abounds in fat. It is sometimes, as in the first two tribes, soft and spongy; while in other species, as the porpoise and grampus, it is hard and firm. In other fishes it is longest in those species that have teeth, with which it is often furnished. Its want of nervous papillæ has been already noticed.

The *gullet* of the *cetacea* has a peculiarity of structure to facilitate the passage of the food without interfering with the blow-holes, on each side of which it passes. In other fishes the gullet is short and generally wide, but often it is scarcely to be distinguished from the stomach in which it terminates.

The *alimentary canal*, comprising the stomach and intestines, exhibits several important varieties. In the cetaceous it is long and complicated, consisting of a stomach composed of four or five distinct but communicating cavities, like what is observed in the ruminating quadrupeds, and very long intestines, distinguished into small and large, and having their inner coat extended into numerous folds. In the other fishes the canal is short and simple; the stomach is a cylindrical, oval, or oblong, sometimes a globular bag, from the end or side of which proceeds a short tube terminating in a common cavity called *cloaca*. Sometimes the stomach is very long; in general it is membranous, but in a few cases muscular.

Digestion in these animals, especially in the two latter divisions, is performed chiefly by the solvent powers of the juices of the stomach, which, though they appear to possess no acrid quality, are capable of reducing to a pulpy mass the bones of fishes, and even the shells of crustaceous insects and testaceous mollusca.

The food of fishes, though extremely various, is probably always of an animal nature, though some writers speak of fishes eating sea-weed or swallowing mud. When such substances are found in the stomach, they have doubtless been swallowed by accident with the proper food with which they were mixed. The general food of fishes is either the flesh or spawn of other fishes, various molluscous animals, crustaceous and other insects, worms, or the flesh of dead carcases of men, and marine quadrupeds; but they sometimes seize on water-fowl, or feed on offal thrown into the water.

Chap. IV. Of the Circulation of Fishes.

Great differences appear in the circulating system of fishes, according as they breathe by means of lungs or gills. In the cetaceous tribes, the heart is always double, consisting of two auricles and two ventricles, as in quadrupeds; the blood is red and warm, and in great quantity; the blood-vessels are large and numerous, and some of them much convoluted, and minutely divided, so as to retard the motion of the blood towards particular parts and organs. The circulation of the blood exactly resembles that of man and quadrupeds; that fluid first passing from the right ventricle through the vessels of the lungs round to the left auricle and ventricle, thence through the trunks and branches of the arteries over the whole body, and being brought back by the branches and trunks of the veins to the right ventricle, repeats the same course. But the structure and function in other fishes are entirely different. In them the heart consists of one auricle and one ventricle, and from the latter rises a single arterial trunk, generally expanding as it leaves the heart, and propelling the blood through the gills, from which it is carried into another arterial trunk, which, like the *aorta* of warm-blooded animals, distributes it over the body, to be brought back by numerous large veins to the auricle and ventricle, and then circulate as before.

From these differences in the circulation of cetaceous and other fishes, it is natural to conclude that a corresponding difference must subsist with respect to their economy; but it is remarkable, that though the cartilaginous and bony fishes agree with reptiles in the cool temperature of their blood, they are deficient in that remarkable property possessed by reptiles, (See Erpetology,) the great tenacity of life and easy reproduction of parts injured or destroyed. Very few instances, as the eel and carp, have been noticed in the present treatise, where fishes long outlive removal from their native element; and though in the former example, divided parts show irritability and motion for some time after being separated, it is not known that in the living animal any reproduction of injured or destroyed parts takes place.

Chap. V. Of Absorption in Fishes.

The absorbent system of fishes differs in few respects from that of the higher classes of animals, and nearly resembles the same system in reptiles, except that in fishes the vessels appear to be destitute of valves. The absorbents which pass to the skin in this class are said to be easily detected; but probably they are often confounded with the exhalant vessels that have the same direction. As in reptiles, the lacteals are very numerous; but the lymphatic glands are either very few or entirely wanting.

Chap. VI. Of Respiration in Fishes.

The functions of circulation and respiration in all animals are so nearly connected, that the same differences that have been already remarked in the former system of the present class must be expected to prevail in the latter. In fact, nothing can be more opposite than the respiratory organs of cetacea and of other fishes. In the former there is a distinct thorax, containing lungs which differ from those of quadrupeds chiefly in being long and thin, and closely attached both to the *pleura* and diaphragm, while in the latter are seen only vascular plates on each side of the neck, more or less exposed to the immediate action of the water. But the accessory organs of respiration in cetaceous fishes are very complicated, and require rather a minute description. The *larynx*, or upper part of the wind-pipe is composed of cartilaginous pieces, as in quadrupeds, but they are somewhat differently shaped and proportionally thicker; and is lengthened upwards or forwards within the throat into the form of a pyramid, which divides the entrance of the gullet, and approaches the blow-holes, the internal orifices of which are regulated by particular muscles capable of contracting those orifices at the will of the animal. The wind-pipe is generally long and wide, so as to admit a great quantity of air to the lungs.

The *blow-holes* are two canals passing from the roof of the mouth towards the back part of that cavity through the bones of the skull in a straight or curved direction, and terminating in some part of the upper surface of the head. In all the species the canals are distinct at their commencement in the mouth; and in several they continue separate to their external outlet, while in others they unite near the top of the head. The external orifice is always situated on that part of the head which is most prominent; but as that part is sometimes about the middle, and sometimes near the snout, the opening is diversified accordingly. The Eustachian tube ascends upwards to the top of the spout-holes, with the cavity of which it communicates; and that part of it which is next the internal ear exhibits a remarkable depression, with which are connected several membranous cavities. The two bony canals near their external orifice are closed by two semicircular fleshy valves, which prevent the entrance of water from without, and require some force to open them from within, so as to admit the passage of water in that direction. This structure explains the height to which the water is often thrown, and the noise produced by its ejection.

The gills of fishes are usually composed of four vascular plates on each side, fixed to bony or gristly arches, by which they are connected with the bone of the tongue. In some of the cartilaginous fishes they are fixed, but in the bony fishes are more or less moveable. They communicate with the throat by means of tubes, generally one to each gill. The diversities with respect to their external openings, and the want or presence of a gill-cover and branchiostegous membrane, have been already noticed in the characters of the orders and tribes.

From this account, it will appear that the respiration of cetaceous fishes resembles that of quadrupeds, with the modification produced by the mechanism of the blow holes; while in the other fishes this function is performed through the medium of the water, which, containing air, supplies the necessary stimulus for restoring to the blood those properties which it had lost in the course of circulation.

It is not certain that any fishes possess the faculty of emitting vocal sounds, though some of the *cetacea* are supposed to utter cries when wounded or irredeemably entrapped; and Lacepede strenuously argues that the structure of their *larynx* qualifies it for becoming an organ of voice.

CHAP. VII. OF SECRETION IN FISHES.

The only secreting organs to be noticed in this chapter are, the salivary glands, the *pancreas*, the liver, and the spleen.

The *salivary glands* are wanting in all bony fishes, in all the cartilaginous tribes, except the rays and sharks, and in those cetaceous fishes which are destitute of teeth. When found they are small and simple.

The *pancreas* or sweetbread, which is nearly allied to the salivary glands, is found in most cetaceous fishes. It is a long, flat, glandular body, situated between the first stomach and the spine, and communicating with the upper part of the intestines by certain ducts. A similar organ exists in the chondropterygious fishes; but in the rest of the class it is wanting, and its office is supplied by the intestines.

The *liver* is the largest and most important secreting organ in fishes. In the cetaceous tribes it nearly resembles the liver of ruminating quadrupeds, and is divided into two principal lobes, but is situated chiefly on the left side of the body; but in these animals there is no gall-bladder. In the other fishes the liver also lies on the left side, and is generally very large in proportion to the body. In some fishes it is entire, but in others it is divided into two or three lobes. Its usual colour is brown of various shades, mixed with yellow. Most fishes have a gall-bladder, with ducts leading to the intestines. The bile which it contains is bitter and resinous, and in some species is said to be poisonous.

The spleen is also a very constant organ in the animals of this class, but there is much diversity in its situation and form. In the cetacea it is on the left side, and is generally single; but in the porpoise, and a few other species, it is divided into lobes, or rather several small spleens. Whenever the stomach is complicated, the spleen is attached to the first cavity. In the other fishes it is sometimes situated on the stomach, sometimes between the stomach and the liver. In many species it is between the air-bag and the bowels, and is then generally attached to the latter. It is readily distinguished from the liver by its darker colour. Its form is sometimes triangular, and sometimes nearly spherical. It is usually entire, but in some cases is divided into lobes, united to each other by slender films. The actual use of the spleen in fishes is uncertain.

CHAP. VIII. OF THE INTEGUMENTS OF FISHES.

The organs of covering and defence in fishes present many important varieties. They consist of the skin, with its appendages of scales, spines, and tubercles or plates, and the fat; and as the ordinary weapons, both offensive and defensive, with which these animals are provided, are generally more or less connected with the skin, they are here noticed under the same head.

The integuments of cetaceous fishes nearly resemble those of marine quadrupeds, consisting of a cuticle, mucous net-work, true skin, and cellular membrane. The cuticle is generally very dense and thick, and composed of several layers. On its outer surface it is smooth, and generally glossy, from the quantity of oil which oozes through its pores from the parts below. Its inner surface is rough, appearing often like the pile of coarse velvet. In these tribes it is perfectly free from hair or scales,—thus constituting a remarkable distinction between cetaceous animals and the marine quadrupeds on the one hand, and between the former and the proper fishes on the other. The mucous net-work of the cetacea is much thicker than the same membrane in quadrupeds, and is easily confounded with the inner surface of the cuticle. This membrane appears to be the origin of the colours that appear on the surface of the body. The true skin of cetacea is extremely villous or unequal next the cuticle, displaying numerous soft, elastic, vascular eminences, often of considerable length, It is not very elastic, and generally appears on the full stretch, though in some species it is wrinkled or contracted into folds. The fat or blubber is contained within the cellular membrane, lying between the true skin and the muscles, and is generally several inches in thickness. It is thicker in proportion in the young cetacea, and gradually contracts, and its cavities become more fibrous as the animals advance in age.

The only weapons which require particular notice, in the cetaceous animals, are the horns or tusks of the narhwals and anarnak; in the former they are long, straight, tapering, and pointed, and generally exhibit several spiral grooves on the surface; in the latter they are short and crooked. It is probable that these tusks are always two in number in the young animal, though in the narhwals one is generally found wanting. They are fixed in sockets in the upper jaw, and are of a firm compact texture, superior as ivory to the tusk of the elephant.

The cuticle of the other fishes is thin, soft, and generally formed of a single layer. It is inelastic, porous, and pellucid, and though not thrown off entire as in some reptiles, is occasionally detached in portions and renewed. The mucous net-work is also thin, but often remarkable for the brilliancy of its colours, which appear through the cuticle and scales. The true skin is thickest in those species which have the smallest scales, while in such as have large scales it is in general extremely thin, resembling a film. This membrane is remarkable for wanting that papillary or villous texture which is so conspicuous in the cetacea. The skin is very gelatinous, and easily converted into glue.

Mucous secretion.—The outer skin of most fishes is continually moistened with a slimy or mucous fluid, which tends to preserve its softness, and enables it to resist any injurious action of the water. This fluid is formed in certain canals situated between the true skin and the muscles, and in osseous fishes lying chiefly in the direction of the lateral line. From the canals numerous smaller ducts convey the mucus to the pores of the cuticle, through which it passes to the surface.

The cellular membrane is scarcely developed as a distinct layer in the lower tribes of fishes, but is intimately connected with the muscles, and is much less productive of oil than in the *cetacea*. A few fishes, however, as the herring, the pilchard, the salmon, and some others, are very oily in the flesh; but in most species the oil is found in the greatest quantity in the liver.

Scales.—Lacepede and Blumenbach are of opinion that all the cartilaginous and bony fishes are covered with scales, though these appendages are sometimes so very minute, or so easily fall off, as scarcely to be detected after the death of the animal. They are fixed in the cuticle, and generally covered by that membrane. They cover each other like tiles on the roof of a house, having their outer edge directed backwards; so that in passing the hand along the skin of a fish its surface feels smooth from head to tail, but rough in the contrary direction. In their structure they are composed of alternate layers of membrane and phosphate of lime; and, when viewed with the miscroscope, appear ribbed longitudinally, and streaked transversely. The small scales of the bleak and some other fishes, when separated, have a silvery or pearly appearance, and are employed in the manufacture of artificial pearls. See Glass Manufacture.

Sometimes the scales are conglomerated together into large plates, like the shell of a limpet, as in the sturgeon; and several fishes, as the *ostracion* tribe, have the whole body enveloped in a hard bony shell.

Spines are found on various parts of many species of fish. In some, as the *diodon* tribe or porcupine fish, they cover almost the whole surface like the skin of a hedge-hog; in other cases they project from the head like horns; or both from the head and posterior part of the body, as in the trunk fish, while in others, as the sticklebacks, they are attached chiefly to the back and belly. In a few instances they are confined chiefly to the head, and occasionally a long spine or two project from the back. In all these instances they appear to be horny projections from the cuticle, like the horns of some quadrupeds; but the more formidable weapons of the saw-fish and sword-fish, are real bony processes, formed by an elongation of the upper jaw.

The fins, already described among the organs of motion, often constitute, from their spinous rays, very effectual weapons, both offensive and defensive, and in some species inflict very severe and even dangerous wounds.

Chap. IX. Of the Reproduction of Fishes.

As in circulation and respiration, the cetaceous and proper fishes differ widely from each other in the present function. The former almost exactly resemble quadrupeds in this respect. The female suckles her young and secretes milk very similar to that of the cow. Her period of gestation, too, is very similar, being as is supposed about ten months. The cartilaginous and bony fishes resemble reptiles, in the female producing eggs, which are committed to the care of Providence, and, except in a very few species, hatched by the heat of the sun. But they differ from all other vertebral animals in the distinction of the milt or soft roe in the male, and the hard roe in the female; for in all fishes, with the exception of the lampreys and the blind hag, the sexes are distinct.

Reproduction. The *milt* differs in form, situation, and structure in the cartilaginous and in the bony fishes. In most of the former, especially the rays and sharks, it is composed of two long flat bodies, situated between the spine and the alimentary canal, and consisting partly of a soft uniform substance, and partly of numerous small glands of a globular figure. In those fishes which are more strictly oviparous, comprehending some cartilaginous and nearly all the bony fishes, the milt is also double, of a lengthened form, and of a white colour; but the divisions are situated one on each side of the belly, at a distance from the spine, and are composed entirely of a soft glandular substance divided into little bags.

The *roe*, or hard roe as it is commonly called, is generally composed of two longish bodies enveloped in a vascular membrane, and containing eggs. In most of the cartilaginous fishes it is situated on each side of the spine, and the eggs are of various sizes, and from each proceeds a tube for its conveyance to the general receptacle or oviduct. In the bony fishes the roe is sometimes single; it is lodged in the belly like the milt, and the eggs are nearly of the same size, and arranged in transverse layers, separated from each other by vascular membranes. They are not furnished with distinct oviducts, but the roe is generally expelled entire.

The *eggs* of bony fishes, like those of other oviparous animals, are composed of a yolk and white or *glaire*, but the yolk, though surrounded by the glaire, is situated on one side of the egg, and the embryo or rudiment of the future fish is lodged between the two. The number of eggs differs considerably in the various species, though it is always very great. They are extremely numerous in the carp, the tench, the cod, the flounder, the sole, and the herring, often amounting to several millions in a single individual.

The *developement* of the embryo is very curious. It is completed in very different periods, according to the species. Thus, in the carp, it is supposed to be perfected in the course of three weeks, while in the salmon it is said to require as many months. In this gradual evolution the heart is the first organ that becomes obvious to the senses, then the spine, eyes, and tail. In course of a short time the fins become visible, first the pectoral then the caudal, which are followed successively by the dorsal, the ventral, and the anal. Different fish deposit their eggs in various situations,—some in holes in the sand, others in clefts of the rocks, while many attach them to fuci and other sea or river plants. Sometimes both the male and female assist in this office, though it is not certain that either parent takes any farther charge of the offspring. The male of one species of cyclopterus is said to watch over the eggs in order to defend them from other fish; but it is also believed that he does so for the purpose of appropriating them as food to himself.

Explanation of Plates.

Plates. Plate 105. Fig 1. *Balæna Mysticetus*, or Greenland-Whale, with the mouth open, copied chiefly from a late drawing by Mr Scoresby, junior. Fig. 2. *Raia Torpedo*, the Torpedo or Cramp-fish. Fig. 3. *Squalus Zygæna*, the Hammer-headed Shark. Fig. 4. *Pristes Antiquorum*, the Saw-fish. Fig. 5. *Ostracion Cornutus*, Horned Trunk-fish. Fig. 6. *Xiphias Gladius*, Common Sword-fish. Fig. 7. *Coryphæna Hippurus*, Dolphin Coryphæna.

Plate 106. Fig. 8. *Cottus Quadricornis*, Sea-scorpion. Fig. 9. *Scorpæna Volitans*, Flying Scorpæna. Fig. 10. *Trigla Hirundo*, Tub-fish. Fig. 11. *Sparus Fasciatus*. Fig. 12. *Chætodon Faber*, the Smith. Fig. 13. *Zeus Faber*, the John Doree. Fig. 14. A curious variety of *Cyprinus Auratus*, or the Gold-fish, remarkable for its trifid tail, and for being destitute of the usual dorsal fin.

INDEX.

A

Abdominal order - - 351
Accipenser genus - - 340
Air-bag of fishes - - 358
Ammodytes genus - - 343
Anarchicas genus - - ib.
Anchovy - - - 355
Angler tribe - - 340
Apodal order - 341

B

Balæna genus - - - 333
Balænoptera genus - - 334
Banstickle tribe - - - 347
Blade-fish, electrical - 342
Blenny, Viviparous - - 345
Bones of fishes - - 356
Branchiostegous order - 340
Bull-head tribe - - 347
Barbot - - - 345
Butskopf - - - - 337

C

Cachalot tribe . - 335
great headed - - 336
Cæcilia genus - - 341
Callionymus genus - - 43
Carp tribe - - - 355
common - - ib.
Chætodon genus - - 349
Char - - - 352
Chondropterygious order - 337
Circulation in fishes - - 360
Clupanodon genus - - 355
Clupea genus - - - 354
Cobitis genus - - 351
Cod tribe - - - 344
common - - ib.
Coryphæna genus - - 346
Cottus genus - - - 347
Cyprinus genus - - 355

D

Dab - - - - - 350
Delphinus genus - - 536
Devil, sea - - - 340
Dolphin tribe - - - 336
common - - ib.
coryphæna - - 346
Doree tribe - - 350
Dragon, sea - - 341
Dragonet tribe - - 343

E

Echeneis genus - - 346
Eel tribe - - 342
blind - - - ib.
conger - - ib.
electrical - - - ib.
sand - - - - 342
Eggs of fishes - - - 363
developement of - ib.
Esox genus - - - - 353
Exocœtus genus - - - 354

F

Father-lasher - - - 347
Feeling in fishes - - 55

Fins of fishes described - 332, 357
Fin fish - - 334
Fishes, how distinguished - 329
  cetaceous - - 332
  cartilaginous - - 337
  bony - - 341
  structure and functions of 356
  motions of - - - 356
  sensation and instincts of 358
  digestion of - - 359
  circulation of - - 360
  absorption of - - ib.
  respiration of - - ib.
  secretion of - - 361
  reproduction of - -
Flat fish tribe - - 350
Flounder - - - - ib.
Flying fish tribe - - 354
  common - - ib.
Food of fishes - - - 360

G

Gasterosteus genus - - 347
Gastrobranchus genus - - 338
Gibbar - - - - 334
Gilthead tribe - - 349
Gills of fishes - - 361
Gladiator - - - 337
Gold-fish - - 356
Groundling - - - - 351
Gurnard tribe - - 348
Gymnotus genus - - 342

H

Haddock - - - 344
Hag, blind - - 338
Hearing of fishes - - 358
Herring tribe - - - 354
  common - - ib.
Holibut - - - 350
Hyperorodon genus - - 337

I

Jaws of fishes - - 359
Ichthyology, definition of - 326
  general view - 330
  utility of - ib.
  difficulty of - ib.
  method of studying ib.
  writers on - 331-332
  nomenclature of - ib.
  classification of - ib.
  history of - - ib.
Integuments of fishes - 361
Instincts of fishes - - 359
John Doree - - 350
Jugular order - - 343

L

Labrus genus - - 348

Lacepede's classification of fishes 332
Lamprey tribe - - 337
  common - - 338
Launce tribe - - 343
Ling - - - 344
Loche tribe - - 351
Lophius genus - - 340

M

Mackerel tribe - - 345
  common - - - ib.
  Spanish - - 346
Motions of fishes - - 357
  swimming - - ib.
  leaping - - 358
  flying explained - ib.
  climbing - - ib.
Mouth of fishes - - 359
Mugil genus - 353
Mullet tribe - - ib.
  common - - ib.
Mullus genus - - 348

N

Narhwal tribe - - 335
  common - - ib.

O

Ostracion genus - - 341

P

Pegasus genus - - 341
Perch tribe - - 349
Petromyzon genus - - 337
Pike tribe - - - 353
  common - - ib.
  gar - - - ib.
Pilchard tribe - - 355
  common - - ib.
Piper - - - 348
Plaise - - - 350
Pleunectes genus - - 350
Porpoise - - - 336
Pristes genus - 340

R

Ray tribe - 383
Respiration in fishes - - 360
Rorqual - - - 334

S

Salmon tribe - - - 352
  common - - - ib.
Saw-fish - - - - 340
Scales of fishes - -
Scomber genus - - - 345
Scorpæna genus - - 347
Scorpion, sea - - ib.

Shark tribe - - 359
  basking - - ib.
  white - - ib.
Silurus genus - - 351
Scate common - - - 338
  electrical - - ib.
Smelling in fishes - - 358
Smelt - - - - 353
Sole - - - 351-353
Sound of fishes, nature of - 358
Sparling - - - 353
Sparus genus - - 349
Spermaceti, nature of - - 335
Squalus genus - - 339
Stickleback, three-spined - 347
Sturgeon, common - 340
Stylephorus genus - - 343
Sucking fish - - 346
Sun-fish tribe - - 341
Sword-fish - - 343
Surmullet - - - 348

T

Teeth of fishes - - - 359
Tench - - 356
Tetrodon genus - - 341
Thoracic order - - - 345
Toad-fish - - - 340
Torpedo - - - 339
Torsk - - - - 344
Trichiurus genus - - 342
Trigla genus - - 348
Trunk-fish, horned - 341
Trout, river - - - 352
  salmon - - - ib.
Tunny - - - - 346
Turbot - - - 351

V

Vision in fishes - - 359

U

Unicorn fish - - 335

W

Whalebone described - - 359
Whale tribe - - 333
  Greenland - - ib.
  scrag - - 334
  finned - - - ib.
  round lipped - - ib.
Whiting - - - - 345
Wolf-fish - - 343
Wrasse-tribe - - - 348

X

Xiphias genus - - 345

Z

Zeus genus - - - 350

ICHTHYOLOGY

PLATE 106.

Fig. 8.

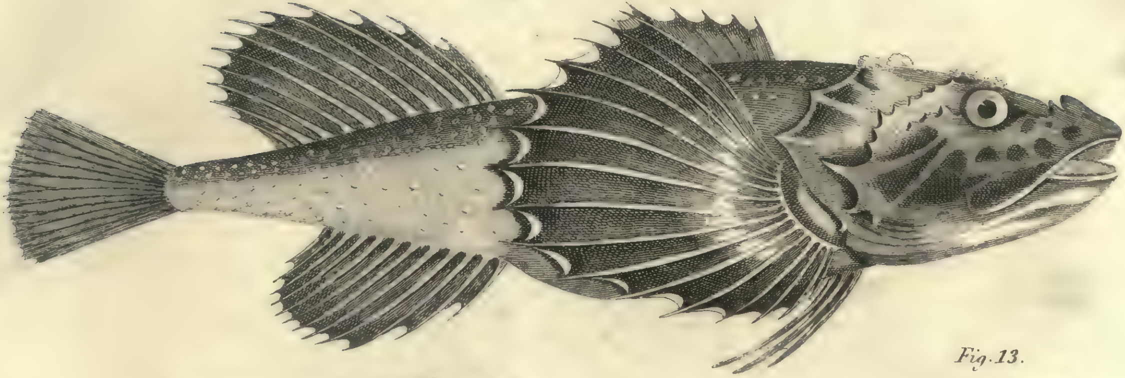


Fig. 9.

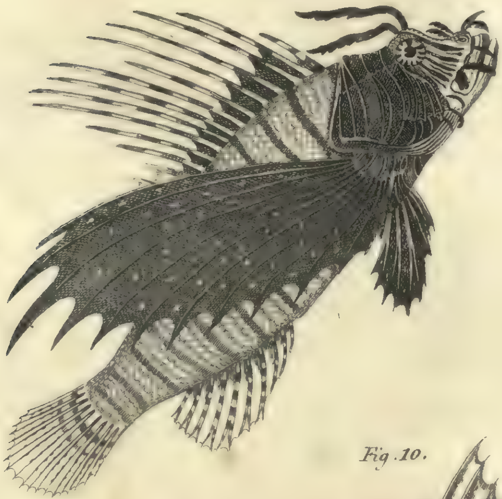


Fig. 13.

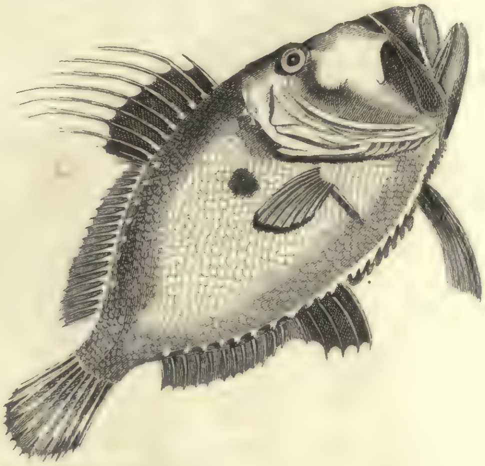


Fig. 10.

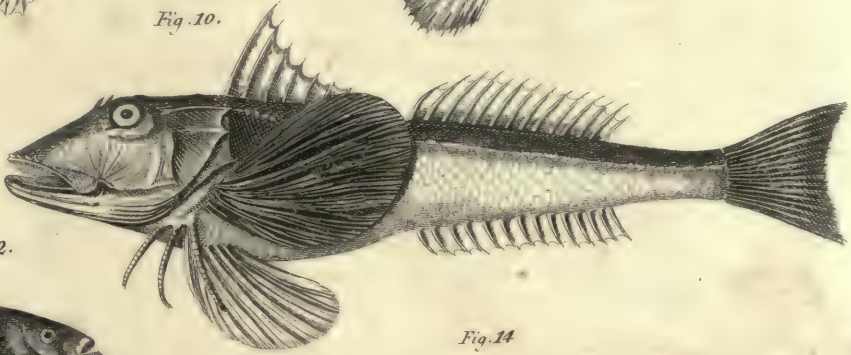


Fig. 12.

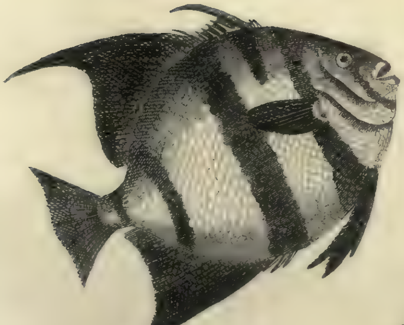


Fig. 14

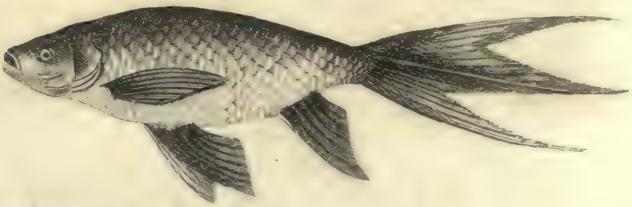
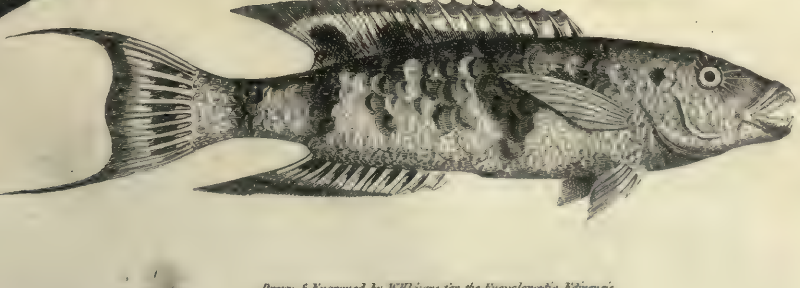


Fig. 11.



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ICOLMKILL, or IONA, one of the Hebrides or Western islands of Scotland, celebrated for its ancient religious establishments. See *Iona*, under HEBRIDES.

ICOSANDRIA, the twelfth class of plants in the Linnæan system. See BOTANY.

IDA, a celebrated mountain of Asia, which, according to Homer, was visited by the gods in the time of the Trojan war, and is assigned by the poets as the place where Paris decided on the beauty of the goddesses Minerva, Juno, and Venus. The same name is given to a mountain of Crete, which, according to ancient mythology, was the nursing place of Jupiter.

IDEA, a term in frequent use by the older metaphysicians, and employed indefinitely to denote the sensation produced by external objects, or the perception or impression left on the mind as the consequence of that sensation.

IDES, in the ancient Roman kalendar, were eight days in each month, the first of which fell on the 15th of March, May, July, and October, and on the 13th day of the other months of the year. The ides intervene between the kalends and the nones, and were reckoned backwards; thus, the 14th day of March, May, July, and October, and the 12th day of the other months, was called *pridie idus*, or the day before the ides; the next preceding day was called *tertia idus*; and so on, always reckoning backwards, till the eight days of the ides were completed, when the nones commenced.

IDIOPATHY, or IDIOPATHIC, is a term employed by medical writers, and is expressive of a disorder peculiar to a certain part of the body, which is not the consequence of any preceding disease; and it is opposed to sympathy or sympathetic, which is the result of some other affection.

IDIOSYNCRASY is a peculiar temperament of body in some persons, by which it is rendered more subject to certain disorders than others of a different constitution or temperament.

IDOLATRY, or the worship of idols, has been divided into two kinds, by the first of which adoration is paid to the works of nature, as the sun, moon, stars, and certain animals, and by the second it is offered to the works of men, as statues or pictures.

IDRIA, a district of Carniola, a duchy of the circle of Austria, has been long famous for its rich mines of quicksilver. Idria is also the name of the chief town of the district, contains about 4000 inhabitants, and is chiefly supported by the mines in its vicinity. See CARNIOLA.

IDYLLION is the diminutive of the Greek word signifying a *song* or *poem*, and denotes a short composition of this description. The poems of Theocritus have this title, and, as they are chiefly pastoral, the name is in some degree appropriated to short pastoral poems.

JEDBURGH, a borough town, and capital of Roxburghshire in Scotland, and contains nearly 3000 inhabitants, many of whom are employed in the manufacture of coarse woollen stuffs. See ROXBURGHSHIRE.

JEDDO, the principal town of the islands of Japan, and the residence of the emperor. See JAPAN.

JELLY is a substance of a solid tremulous consistence, obtained from different parts of animals, as well as from certain fruits. See CHEMISTRY and DIETETICS.

JENA, a town of Thuringia, in the circle of Upper Saxony in Germany; is surrounded with walls, is celebrated for its university, and is memorable for a dreadful battle, fought in 1806, between the French and Prussians, in which the latter were defeated with great loss. The town is washed on two sides by the river Saale; and the valley in which it is situated, as well as the neighbouring territory, is peculiarly favourable for the culture of the vine. Jena is ten miles to the eastward of Weimar.

JENKINS, HENRY, a native of Yorkshire, who lived to the great age of 169 years. He died in 1670, and an account of his life appeared in the Phil. Trans. No. 221.

JENYNS, SOAME, an eminent English author, was born in 1703, was educated at Cambridge, and first appeared as a poet in "An Essay on the Art of Dancing," which was published in 1727. But he is chiefly distinguished by his "Free Enquiry into the Nature and Origin of Evil," and his "Internal Evidences of the Christian Religion." He retained his seat in the House of Commons, as member for the county of Cambridge, for the long period of 38 years previous to 1780, and for some time he held the place of one of the commissioners of the board of trade. He died in 1787.

JEROME, SAINT, or HIERONYMUS, one of the ancient fathers of the Christian church, was born about the year 329 at Strido, a town of Pannonia; studied at Rome under the celebrated Grammarian Donatus, and travelled into different countries to extend and improve his knowledge. Having visited Jerusalem, he commenced a monastic course of life, and, retiring to a desert in Syria, assiduously devoted himself to the study of the eastern languages, and more especially of the sacred scriptures. Returning to Antioch, he was ordained a priest, and having visited Constantinople and Rome, he retired to Bethlehem, in Judea, to avoid the dissensions on religious matters in which he was involved with the adherents of Origen. His piety and learning drew around him many persons of both sexes, who were desirous of devoting their lives to religious meditation. He died in 420, when he had reached the 90th year of his age. The eulogium past upon St Jerome by Erasmus, "that he was the greatest scholar, the greatest orator, and the greatest divine that had then appeared in the Christian church," is contradicted by others, who pronounce his eloquence to be declamatory, his knowledge of languages not very accurate, and his reasonings obscure. The first edition of his works, with his life prefixed, was published by Erasmus in 1526, and an enlarged edition, in eleven volumes folio, appeared at Verona.—Mosheim's *Church History*, Vol. I.

JEROME of PRAGUE was so designated from the place of his birth, a town of Bohemia, and was the associate of John Huss, whose opinions he had adopted, and for which he was condemned and brought to the stake in 1416. See HUSS.

JERSEY, an island situated in the English channel, and near the coast of Normandy, approaches to the form of a parallelogram, and the greatest length is 12 miles, and the breadth seven miles.

Aspect.—The surface is irregular; numerous valleys traverse the island; the cliffs on the north rise from 100 to 200 feet in height, but the land declines gradually towards the south; the coast is indented by many fine bays, but they do not afford shelter from storms; a chain of rocks running from the north and north-east is dangerous to mariners. The island is remarkably well watered; and in the parishes of St Mary and St Saviour are two chalybeate springs. The soil is light and fertile.

Climate.—The climate is favourable, and frost and snow are of short continuance in the winter season; fogs and gales of wind from the east are of common occurrence; and pulmonary affections and scrophula are incidental to the inhabitants.

Natural History.—The rocks of Jersey are chiefly syenite, and on the north present broad perpendicular faces to the sea; a sort of granite is quarried at Mont Mado, and other places. The metallic substances discovered are iron, manganese, and copper; ochre is plentiful, and some kinds of tripoli; but no emery has been discovered, although often said to be a production of Jersey.

The climate is so favourable to vegetation, that in Jersey shrubs sustain no injury in the open air which in England are accustomed to shelter; and spring flowers blow in the open air in the colder season. Madder, dyer's weed, and chamomile grow spontaneously, and samphire is a native of the rocks on the north coast. The orchards are very productive; in particular the *chaumentelle* pear is very much celebrated; and, from the vast abundance of apples, cyder is plentifully manufactured. The sea-weed on the rocky shore is employed for manure, or, when dried, is used as fuel. This substance is by authority appointed to be gathered only at two stated periods in the year. The ordinary farinaceous grains and edible roots of England are cultivated; bearded wheat is reaped in three months; and lucern and clover are common. The vegetable produce of Jersey is not adequate to its consumpt, and temporary scarcity has sometimes been felt.

Fishing is rather neglected, though many species of fish frequent the shores. Rays, turbot, plaise, soles, and mullet are caught, and congers are proverbially abundant about the rocks, some of which weigh 54 lbs.; oysters, lobsters, and crabs are not less plentiful.

The island is much molested with toads of large size; small snakes, which are harmless, and beautiful lizards are numerous; and of three species of field-mice, one is supposed to be the *mus* typhlus, or blind mole, which has been ascribed to Southern Russia; it is of the size of a rat, grey, with long hair, the eyes are hardly visible, and under the fur in the site of the ears are two bare vesicles. The horses are small and hardy; the cows are of that breed called the Alderney cows; sheep are generally black, and of small size; some goats are reared, and hares are scarce.

Population, &c.—The population of Jersey in 1806 was stated at 22,855; and the island is divided into twelve parishes, containing two towns, a number of villages, and several fortresses. The inhabitants still retain some of the manners and customs of their neighbours on the coast; and the French language is the vernacular tongue; but English is likely to become more prevalent.

Manufactures, &c.—The principal manufacture is cyder, of which 24000 hhds. are annually made. Tanning, soap-making, candle-making, are carried on, and great quantities of worsted stockings are spun and knit. The exports are cyder, fruit, potatoes, cattle, and worsted stockings. The principal imports from England are corn, flour, seeds, cloth, and glass-ware, and paving-stone; and great quantities of salt fish are imported from Newfoundland. The commercial concerns of Jersey extend to almost every country in Europe, and also to America.

Government.—The government of Jersey consists of a court of judicature, and an ecclesiastical body, which, with twelve constables, and a military governor, constitutes the assembly of the states. This assembly cannot be held without the consent of the governor, who has also a negative voice; but he is obliged, when the bailiffs or jurats require it, to summon the states within 15 days. By the laws of Jersey, legitimation by subsequent marriage is recognized, as also the *cessio bonorum* of the Scotch law in bankrupt cases.

Towns.—St Helier's, situated on the east of St Aubin's bay, is the capital of the island, and consists of about 1000 houses. The town contains a parish church, chapels for presbyterians and methodists, a theatre, a workhouse, an hospital for the whole island, a new prison, and the court-house on one side of a square, in the centre of which is a statue of George II. in a Roman habit. A public library is established, and regular assemblies are held; and several packets are established between St Helier's and Weymouth, and traders to Southampton.

St Aubins, about four miles from St Heliers, is a small town, consisting of one street, contains a neat chapel, and is protected by a fort, mounting 14 guns, from which a strong pier projects. Some foreign trade is carried on.

Fortifications.—Jersey is strongly fortified. Elizabeth-castle, the proper residence of the governor, defends the approach to St Heliers; besides a chain of martello towers, redoubts and batteries protect all the maritime parts of the island, and commodious barracks are erected for the soldiery.

History.—Jersey is supposed to be the *Caesarea* of Antoninus; but its early history is very obscurely traced. It belonged to Normandy before the subjugation of England by William the conqueror, when it became an appendage of the English crown. The French made many attempts for its possession during the civil wars between the houses of York and Lancaster. In 1518, the plague committed great ravages; and about the same time dissensions and internal commotions prevailed. Jersey participated much in the civil wars of Charles I. and his son. In 1779, an unsuccessful attempt was made upon the island by a body of French troops, and a similar attempt was made in 1781, which was intrepidly and effectually resisted. Jersey formerly contained an

Jersey.

abbey, four priories, above 20 chapels, and 12 churches.

JERSEY, New, one of the United States of North America, is situated between 39° 41′ north latitude, and 74° and 75° 29′ of west longitude; extends in length 160 miles, and breadth on the south 75 miles, and is bounded on the north by New York, on the east and south-east by Hudson's river, New York bay, and the Atlantic, and on the south and west by Delaware bay and river.

Aspect and soil.—This state is mountainous to the northward, but in other parts presents a finely diversified surface. The South Mountain, a great ridge of the Alleghany range, crosses the state; another ridge passes a little to the northward; and on the coast the elevated land rises about 600 feet above the level of the sea. Nearly one-fourth of the whole state is barren and uncultivated. The soil is very various, but the hilly and mountainous parts have a strong soil, in which oaks, chesnuts, hickories, and other trees thrive well, and the land is favourable for grazing. Wheat, rye, maize, buck-wheat, potatoes, oats, and barley, are abundantly raised. Great numbers of cattle are reared for the markets of New York and Philadelphia. The dairy is very extensively attended to, and butter and cheese are made to a great extent.

Rivers.—The principal rivers are, the Delaware and Hudson; the Passaic, which presents some fine cataracts; the Hackinsac; the Great Egg Harbour's River; the Maurice navigable for vessels of 100 tons; and the Musconecunk, which falls into the Delaware.

Population.—New Jersey is divided into thirteen counties, and contains 116 towns. The population is made up of Low Dutch, Germans, English, Scotch, Irish, and New Englanders; and, in 1810, was estimated at 226,868.

Manufactures.—Manufactures are extensively conducted in New Jersey. At the tanneries of Trenton, Newark, and Elizabeth-town, a great deal of leather is prepared. Newark has an extensive shoe manufactory; a glass-house is established in Gloucester county; in different parts paper mills are erected, and extensive and prosperous iron-works are established in Gloucester, Burlington, Sussex, Morris, and other counties. In particular, Morris contains seven rich iron mines, two furnaces, two rolling and slitting mills, and about 30 forges, having from two to four fires each. These iron-works afford annually 540 tons bar iron, 800 tons of pig iron, beside large quantities of sheet iron and nail rods; and the annual produce of the whole state is estimated at 2500 tons. Through New York and Philadelphia, the exports are very considerable, and consist of wheat, flour, horses, cattle, hams, cyder, flax seed, leather, and iron.

Religion and literature.—Of the various religious sects, the presbyterians are most numerous. They had 64 churches in 1811, the Dutch reformed churches the same number; the Episcopal church 24, the Baptist church 30, the Congregational churches 9. The methodists are exceedingly numerous, and the quakers have 44 meeting houses. The state contains 15 incorporated academies, two colleges, one at Princetown, and the other, Queen's college, at New Brunswick. Queen's college was founded by ministers of the Dutch church for the education of their clergy. The college of Princetown is a commodious edifice, and from 70 to 80 students attend the classes during the winter.

Jerusalem
|
Jesus Christ.

History.—The state of New Jersey was, in 1664, included in the patent of Charles II. to his brother, the Duke of York and Albany. At the same period, a tract of land was purchased by the inhabitants of Long Island from the Indians, and called Elizabeth-town; and, in the year following, the colony under Sir G. Carteret became a distinct province.

Towns.—The principal towns of New Jersey are,—*Newark*, a well built flourishing town, with a population exceeding 8000; *Trenton* is the seat of government, and contains more than 3000 inhabitants. *Perth Amboy* has a population of 800; *Burlington*, at which a college is established, includes more than 2400 inhabitants; New Brunswick contains a population of 6300; Princetown is better known for its seminary of learning, which has risen to considerable celebrity, than for its extent or the number of inhabitants; and the estimate of the population of Elizabeth-town is stated at 3000.

JERUSALEM, an ancient city, and capital of Judea or Palestine, is now reduced to the state of a province of the Turkish empire. See Judea.

JESSO, an island or groupe of islands of Asia, and not far distant from its eastern shores, is supposed to be under the authority of a sovereign dependent on the emperor of Japan. It is separated from this island by the straits of Sangar, and is about 300 miles in length, and in some places of the same breadth. The general aspect of the island is mountainous and rugged; a lofty ridge traverses it from north to south; and, like some of the other Asiatic islands, volcanoes in a state of activity have been observed. As Europeans have had little intercourse with this island, not much is known of its history, productions, or inhabitants. Of the latter, two different races are described; the Ainos or native inhabitants, who, in their features and character, have some resemblance to the inhabitants of the Kurile islands to the northward, and are represented as a timid and reserved people; and the Japanese, who are to be regarded as invaders and conquerors, and have formed establishments on different parts of the coast. Matzumay, at the south-western extremity of the larger island, is the chief of the Japanese settlements, and the principal town.

JESUITS, or the Society of Jesus, a famous religious order of the church of Rome, was founded by Ignatius Loyola, in the year 1540. After acquiring immense power and influence in different parts of the world, the order was gradually suppressed in the different states of Europe, from the beginning of the 17th century, when it was expelled from England, till the year 1773, when it was totally abolished by the Pope. See Religion.

JESUS CHRIST, the author and founder of the Christian religion, was born at Bethlehem, a city of Judea, about the year of Rome 748 or 749, and about eighteen months before the death of Herod.

To escape the cruelty of that tyrant, who had ordered a general massacre of the infants about Bethlehem from the age of two years, he was carried into Egypt, and returned to Judea after the death of Herod. In his twelfth year, he appeared in the temple disputing with the Jewish doctors; in his thirtieth year his public ministry commenced; and, to spread the knowledge of his doctrines and precepts, he chose twelve apostles, in allusion to the twelve tribes of Israel, and 70 disciples or teachers, in allusion, it is supposed, to the members of the Jewish Sanhedrim. The ministry of Jesus Christ was confined to the Jews; and, while he remained upon earth, the labours of his apostles and disciples were also limited to that favoured nation. When the purposes of his ministry were fulfilled, he was arraigned before Pilate the Roman governor, was condemned to be crucified, was three days in the grave, and having risen from the dead, conversed with his disciples 40 days after his resurrection, and, in the presence of many of them, was taken up into heaven.

JET, a mineral substance, belonging to the class of combustible bodies, and composed chiefly of bituminous matter. As it is susceptible of a fine polish, and may be turned in the lathe, it is made into boxes, buttons, bracelets, and different kinds of mourning jewels. See Geology.

JEWS, the descendants of the patriarch Judah, and the inhabitants of Judea or Palestine, are now dispersed throughout all nations of the world, and still retaining their ancient religion, are scrupulous in observing all its forms and ceremonies. See Judea.

IGNATIA, St. Ignatius' Beans, a genus of plants belonging to the Pentandria class, of which one species is a native of India.

IGNATIUS LOYOLA, the founder of the celebrated order of the Jesuits, was born at the castle of Loyola in Biscay in 1491; was first employed as a page to Ferdinand V. king of Spain, and while he served as an officer in the army he was wounded at the siege of Pampeluna in 1521. During his confinement, a Life of the Saints was put into his hand, which determined him to abandon the military profession, and to devote himself to the service of religion. Having dedicated himself to the blessed Virgin, he made a pilgrimage to the Holy Land, and on his return to Europe studied theology in the Universities of Spain. While he was in France, he laid the foundation of the new order, the institutes of which were presented to the Pope, who at first refused his assent, but afterwards in 1540 confirmed the institution. The founder died in 1555, and left his disciples *Spiritual Exercises*, and *Constitutions or Rules of the Order*. But the Private Rules or Instructions, entitled *Monita Secreta*, were not discovered till many years afterwards, and are supposed to be the work of some of his successors.

IGNIS FATUUS, or Will with a wisp, or Jack with a lanthern, is a light seen in marshy places, or near stagnant waters, during dark nights, and is supposed by some to be of an electric nature, and by others to be of a phosphorescent quality, or that kind of light which is given out by vegetable matters in the first stage of decomposition.

JIDDA or JODDA, a sea-port town of Arabia Felix, and about 40 miles distant from Mecca, is situated in north latitude 20½°; and although the entrance to the harbour is difficult, on account of shoals and sunk rocks, yet it affords sufficient security to ships in every wind. The trade is considerable, and a great deal of merchandise is conveyed from Jidda to Suez, to supply the markets of Egypt. Jidda indeed may be considered as the port of Mecca, and the great emporium of the trade with India.

ILAY, or ISLAY, one of the principal islands of the Hebrides or Western Isles of Scotland. See Hebrides.

ILCHESTER, a borough town of Somersetshire in England, is a place of considerable antiquity, was one of the principal stations of the Romans, and contains about 600 inhabitants, some of whom are employed in the silk manufactory.

ILEX, the Holm or Holly-tree, a genus of plants belonging to the Tetrandria class.

ILFRACOMBE, a town of Devonshire in England, is situated on the shore of the Bristol channel, contains about 2000 inhabitants, who are employed in domestic manufactures, and in the coasting trade, and during the summer is a considerable resort for sea-bathing.

ILIAD, the famous epic poem of Homer, derives its name from *Ilium* or *Ilion*, the ancient name of Troy, because it relates the history of the war between the Greeks and Trojans, which ended in the destruction of that city.

ILLE and Vilaine, a department in the north-west quarter of France, derives its name from the two rivers whose waters are united at the city of Rennes, the capital of the department. The population exceeds 488,000; corn, hemp, and fruits are abundant in some places, and the produce of the dairy has acquired great celebrity throughout the kingdom. Rennes, St Malo, Vitre, and Fougeres, are the principal towns.

Rennes, which is the capital of the department, stands on the river Vilaine, which traverses the city. It was formerly the see of a bishop, and the capital of Bretagne. It is a place of considerable antiquity, and contains about 26,000 inhabitants.

St Malo, is a sea-port town, and the chief place of a district, is strongly fortified both by nature and art, has a spacious and well frequented harbour, although the approach to it is somewhat difficult, and contains about 9000 inhabitants.

Vitre is also the chief place of a district, is 19 miles eastward from Rennes, and the number of its inhabitants is estimated at 9000.

Fougeres, the principal place of a district, contains about 7000 inhabitants, has some trade in leather, and is 24 miles north-east from Rennes; and *Redon*, with 3000 inhabitants, is 32 miles south-west from Rennes.

ILLECEBRUM, Mountain Knot-grass, a genus of plants belonging to the Pentandria class.

ILLICIUM, Aniseed Tree, a genus of plants belonging to the Dodecandria class.

ILLINOIS, a territory of North America, extends from the river Ohio to the lakes Michigan and Superior, and is bounded by Upper Canada on the north. It derives its name from the river Illinois, by which it is traversed, and the Mississippi and Wabash, and some other rivers, run through part of the territory. Some parts of this country were settled by the French, who were expelled by the British, in whose possession it remained till the American revolution.

ILLUMINATI, a secret society or order which existed in Germany and some other countries of Europe, and whose professed object was to introduce more enlightened views of human institutions, but whose real object, it is alleged, was to subvert every established government and religion, and delivering mankind from the salutary restraints of civil society, to bring them to an imaginary state of freedom and independence. Much has been said and written of this order; but that a society has existed, regularly organised, and working in secret in the way represented, and at the same time possessing such extensive power and influence, little satisfactory proof has been brought forward, and indeed the existence of such an association is scarcely credible. Robison's *Proofs of a Conspiracy*.

ILLUMINATING is a kind of miniature painting, which was much practised for the illustration and ornament of books before the invention of printing. The illuminators, as they were called, painted and adorned manuscripts after they were finished by the ordinary writers; and for this purpose blanks were left, which in manuscripts yet extant were never filled up. This art is of great antiquity; for, according to Pliny's information, Varro wrote the lives of many illustrious Romans, and embellished his work with their portraits. Fine specimens of this art are preserved in different libraries, both in Britain and on the continent. It has been observed, that this art had reached great perfection between the 5th and the 10th century; that it declined from the 10th to the middle of the 14th century; that it was much improved towards the close of the same century; and afterwards, on the revival of the arts and learning, it was still farther improved.

ILMINSTER, a town of Somersetshire in England, contains more than 2000 inhabitants, some of whom are employed in the cloth manufacture; has a fine Gothic church, and is surrounded with fine orchards.

IMAGE, a term in optics, denoting the figure of any object made by the rays of light proceeding from its several points, and meeting in so many other points, either at the bottom of the eye or on any transparent medium which has no reflecting surface. Thus, it is said, the perception of external objects depends on the images formed in the eye.

IMAGINATION is a power or faculty of the mind, by which it is supposed to conceive and form ideas of things which have been communicated to it by means of the external senses.

IMAM, or IMAUM, a Mahometan priest who has the superintendancy of a mosque, and reads prayers to the people. It is also applied to a priest who presides over others; and the same term is used to denote the four chiefs or founders of the principal sects of the Mahometans.

IMERETIA, or IMIRETTA, a small kingdom or principality in the vicinity of Mount Caucasus in Asia, and lying between the Black and the Caspian seas, is said to be more than 100 miles in length, and nearly of the same breadth, is traversed by several rivers which have a rapid course from the mountains, and exhibits a diversified surface of rocks and mountains, extended plains, and fertile vallies. Grain, cotton, hemp, flax, silk, wines, and honey are produced, and fruits are abundant.

This territory, which is supposed by some to be the ancient Iberia, contains about 20,000 families, and is governed by a prince dependent on Russia, under whose influence it fell about the year 1770.

IMPERATORIA, MASTER-WORT, a genus of plants belonging to the Pentandria class.

INCHCOLM, or the ISLE OF COLUMBA, a small island in the firth of Forth, and near the coast of Fife, is famous for its monastery, which was founded about the year 1123 by Alexander I., who had been overtaken by a violent storm, and driven into this island, where he met with a hospitable reception from a hermit then residing in the chapel of St Columba. The ruins of the church, and other buildings, which are of considerable extent, are still visible.

INCHKEITH is a small island in the firth of Forth, nearly opposite to Leith, on which a lighthouse was erected in 1804. See EDINBURGHSHIRE.

INCOMBUSTIBLE CLOTH, a kind of cloth made of the mineral substance asbestos, which resists the action of fire, and seems to have excited considerable attention among the ancients, in consequence of being employed for wrapping up the bodies of the dead, that the ashes might be preserved unmixed with the fuel of the funeral pile. The fibres of the asbestos, it is supposed, were mixed with vegetable matter, and being spun into threads were manufactured into cloth. When exposed to fire, the vegetable matter is consumed, and the mineral matter remaining forms the incombustible cloth. The asbestos was also sometimes reduced into a pulp, and formed into paper, which of course retains the same incombustible property. This kind of cloth is alluded to by Pliny and other ancient authors; and experiments have been made in modern times for the purpose of manufacturing both the cloth and the paper. But it seems to be applicable to no real use, and is to be regarded as an object of mere curiosity.

INDEPENDENTS, a sect of Protestant Christians, which has assumed this name, because each congregation meeting for public worship forms a complete church; and having sufficient power to perform every thing relating to religious government within itself is not subject to other churches. The independents were first known in modern times during the reign of Elizabeth, and one of the principal leaders was Robert Brown.—See BROWN, and RELIGION.

INDIA, an extensive region of the east, which was understood by the ancients to include only the western peninsula, or that portion of Asia on this side of the Ganges. But in some of the descriptions of the moderns, all the countries of the east, as far as the islands of Japan, are comprehended under the general denomination of East Indies. See HINDOSTAN.

INDIANA, a territory of the United States, has for its boundary on the east the state of Ohio, on the south the river Ohio, and on the north and west lake Michigan, the Illinois territory, and the Mississippi. The soil is fertile, and produces wheat, rye, indigo, and tobacco. It is well watered by several rivers, of which the Wabash is the principal. Salt springs are abundant in some parts of the banks of this river, and establishments for the manufacture of salt have been formed. The whole population is stated at 24,000, and is distributed into several counties and townships.

INDICTMENT, a law term, denoting a mode of prosecuting offenders. In English law, it is a written accusation of one or more persons of a crime or misdemeanour, preferred to and presented upon oath by a grand jury.—See LAW.

INDIGO, a blue dye, which is prepared from several species of a plant which grows in warm climates.—See CHEMISTRY and DYEING.

INDIGOFERA, the indigo plant, a genus of plants belonging to the Diadelphia class. Four species of this plant are cultivated for the purpose of extracting the colouring matter, as *Indig. anil*, a native of America; *Indig. tinctoria*, a native of China and the East Indies, which has been introduced into America; *Indig. disperma*, which yields the Guatimala indigo; and *Indig. argentea*, from which is obtained what is called bastard indigo.

INDRE, a department of France, so called from the river which traverses it, is bounded on the north and east by the department of Loire and Cher, on the south by the departments of Creuse and Upper Vienne, and by Vienne and the Indre and Loire on the west; and is about 54 miles from north to south, and 45 miles from east to west. This department contains iron mines, marble quarries, and mineral waters; and the fields and vineyards are very productive. The population is about 208,000, and the principal town is Chateauroux.

INDRE and LOIRE, a department of France, so called from the union of the rivers of the same name, is bounded on the north by the department of the Sarte, on the east by those of Loire and Cher and the Indre, on the south-west by the department of Vienne, and on the west and north-west by Mayne and Loire, and is 50 miles from north to south, and 45 miles from east to west. This department is remarkably fertile, and contains some iron mines and mineral springs. The principal produce is rye, barley, millet, wine, and fruits. The population is about 279,000; and Tours is the capital.

INDUS, a celebrated river of Asia, which is supposed to have its origin on the west side of the Himalaya mountains, a lofty ridge which separates Tartary from India, forms the western boundary of Hindostan, and discharges its waters by several streams into the gulf of Arabia. Including its windings, the course of the Indus is estimated at 1700 miles; in the lower part of its course it is about a mile in breadth, and the depth varies from two to five fathoms, and is navigable for ships of 200 tons burthen for nearly 800 miles.

INFANCY is the earliest part of the life of the human species, and is succeeded by the period of childhood. But in law, infant is applied to a person under 21 years of age, before which time he is not entrusted with the entire management of his own affairs. In criminal matters persons are subjected to punishment at a much earlier age, where sufficient evidence of malice, which according to the maxim of law supplies age, is adduced; thus a boy of eight years of age who through malice and revenge set fire to houses, and a boy ten years of age for murder, suffered capital punishment. In civil matters the ages of male and female are different for different purposes, and long before they reach the full period of 21 years they are capable of consenting to and performing various legal obligations.—See LAW.

INFANTRY, the foot soldiers of the armies of modern Europe. The name, it is said, is derived from an infanta or princess of Spain, who assembled a body of troops of this description, and with them engaged and totally routed a party of Moors who had successfully opposed her father.

INFEFTMENT, a term in the law of Scotland, denoting the solemnity of the delivery of an heritable subject to the purchaser.

INFERIAE, were sacrifices among the Greeks and Romans, which were offered to the souls of deceased heroes or illustrious persons, and even to relations or friends whose memory was held in veneration. These sacrifices consisted of honey, water, wine, milk, and the blood of victims, with various balsams, chaplets, and loose flowers. The smaller animals were the usual victims on such occasions; but in ancient times slaves or captives were sometimes sacrificed.

INFIDELITY, in its general meaning, signifies a want of faith or belief in any matter which is the subject of consideration. But, in a more restricted sense, it is usually employed to denote a disbelief of the Christian religion.

INFINITIVE, a term in grammar denoting one of the moods which serve for the conjugation of verbs.—See LANGUAGE.

INFIRMARY is an hospital for the reception of the sick poor, and is supported by the public, or endowed with funds to defray the necessary expense by benevolent individuals. Establishments of this kind are not uncommon in all the great towns of the British empire, and even in most of the provincial towns.

INFLAMMABLE-AIR is that kind of air which readily undergoes the process of combustion, and consists of hydrogen gas, either in a state of purity or combined with some other combustible matter, as carbone or sulphur.—See *Hydrogen* under CHEMISTRY.

INFLAMMATION is a term in medicine expressive of redness and swelling in any part of the body, and accompanied with heat and pain.—See MEDICINE.

INFLEXION, or DIFFRACTION OF LIGHT, is a term in optics, denoting that property of light which causes it to be bent from any body, or towards it, when it approaches within a certain distance.—See OPTICS.

INGOLSTADT, a town of Bavaria in Germany, stands on the banks of the Danube, and is a place of great strength. The university, which has acquired great celebrity, was founded in 1472. In all the wars of Germany with the neighbouring states, Ingolstadt has been alternately in the possession of the different contending powers. It is 37 miles north from Munich, and 33 miles north-east from Augsburg.

INGRIA, a province of Russia situated on the gulph of Finland, and about 130 miles in length, and 50 miles in breadth. It was conquered by the Czar Peter the Great, having been formerly subject to Sweden, and is now denominated the government of Petersburgh.

INK, a liquid which is used in writing and printing. Writing ink is generally made of a solution of copperas or sulphate of iron, an infusion or decoction of galls, and mucilage of gum-arabic. The properties of good writing ink are, that it should flow freely from the pen, and sink a little into the paper; that the writing be not easily discharged; that it should be of a deep black colour, and the intensity of colour should be as great at first as afterwards; that it should be durable, so that the writing may not decay by keeping; and that it should be free from any corrosive quality, that the paper may not be injured. But it rarely happens that ink possesses all these qualities.

The usual ingredients in the composition of writing ink, as already noticed, are sulphate of iron, decoction of galls, and mucilage of gum-arabic. From the experiments of Dr Lewis, it is inferred, that the decay of ink is chiefly owing to a deficiency of the galls, that the galls are the most perishable ingredient, and that the quantity of them which gives the deepest colour at first is insufficient to maintain the colour; and that, to prepare a durable ink, the quantity of galls should not be less than three times that of the sulphate of iron; and if the proportion be increased, the intensity of the colour is diminished. A decoction of logwood employed instead of water, improves both the beauty and deepness of the black, without disposing it to fade; and the addition of gum-arabic is not only necessary for keeping the colouring matter suspended in the fluid, but also for preventing the ink from spreading. Sugar, which is sometimes added to ink, is less efficient for this purpose, and has this inconvenience, that the ink requires a longer time to dry. It has been found, that the colour of ink is considerably injured by keeping it in vessels of copper or of lead, and perhaps of any other metal excepting iron, in consequence of the precipitation of the iron and the solution of some of the other metals.

The proportions of the ingredients recommended by Dr Lewis are, one part of sulphate of iron, one part of powdered logwood, and three parts of powder of galls. For common purposes, water will be found to answer; and when the ink is required of a deep colour, not more than a quart, or at most a quart and a half, should be allowed to three ounces of the galls and to one ounce of each of the other two ingredients, to which are to be added one ounce or one ounce and a half of gum-arabic. The ingredients being introduced into a convenient vessel, kept in a warm place, and shaken several times daily, will be fit for use in ten or twelve days.

Of different kinds of ink, and in different proportions of the ingredients, as they were examined by Chaptal, the following are the results.

Composition or Mixture.

1. The solutions of iron, galls, and mucilage mixed in equal proportions.

Composition bluish, blackening by keeping, and forming in time a good ink, without, however, becoming perfectly black. The writing executed with it does not become so black as the ink becomes in the bottles.

2. Two parts of the solution of iron, one part decoction of galls, and one part mucilage of gum-arabic.

Ink violet, losing its colour on paper. Acquires a little additional blackness in the bottle. Paper dipt into this ink assumes a dark grey colour.

3. Four parts solution of iron, one part decoction of galls, one muscilage.

Ink violet, losing part of its colour on paper, and changing to a greyish yellow; blackens in the bottles.

4. One part solution of iron, two parts decoction of galls, two mucilage.

Ink of a beautiful violet blue; preserves its colour on paper; improves and blackens in the bottles. Paper dipt in water preserves the ink of a fine blue colour.

5. One part solution of iron, three parts decoction of galls, and three mucilage.

Better than any of the preceding; blackens very much in the bottles; changing little in the air; and preserving nearly the same colour when the paper is dipt in water.

6. One part solution of iron, six parts decoction of galls, and six mucilage.

Brownish black. Paper dipt in it assumes a deep red black; blackens little in the air, and very little in the bottles.

7. One part solution of iron, one decoction of galls, and two mucilage.

Ink of a good quality, though somewhat bluish. Too thick; blackens in the air and in the bottles; very glossy.

8. One part solution of iron, six decoction of galls, one mucilage.

Ink of a brownish black. Too thin; sinks into the paper; does not improve in the air nor in bottles.

9. Four parts solution of iron, six decoction of galls, four mucilage.

Ink of a very dark colour; bluish black; flowing well under the pen; improves in the bottles and on paper.

In Professor Robison's notes to Dr Black's lectures, it is observed, that the great art of ink-making is to have a superabundance of astringent matter to counteract the tendency of the iron to further oxidation, which renders the ink brown; and it is suggested that it would be a great improvement in the manufacture of writing-paper to have it impregnated with some astringent matter. The spoiling of ink is prevented by the addition of a little ardent spirits; but then it sinks and spreads on the paper. It has been found that corrosive sublimate completely prevents mouldiness. But the use of this deleterious substance is not always very safe. For the same purpose some aromatic substance, as cloves, is employed. The following are recommended, from the same authority, as the proportions of the ingredients in the composition of good writing-ink.

Rasped logwood, one ounce.
Best gall-nuts in coarse powder, three ounces.
Gum-arabic in powder, two ounces.
Green-vitriol, or sulphate of iron, one ounce.
Rain-water, two quarts.
Cloves in coarse powder, one drachm.

Boil the water with the logwood and gum to one-half; strain the hot decoction into a glazed vessel; add the galls and cloves; mix and cover it up. When nearly cold add the green vitriol, and stir it repeatedly. After some days, decant or strain the ink into a bottle, to be kept close corked in a dark place.

The addition of the cloves retards any change that is apt to take place on the vegetable astringent. This change is apt to occur when the ink is long kept; and it is promoted by keeping it in a warm place, so that a cool and dark situation should always be selected for keeping it.

As the blackness of common ink is destroyed by some of the acids, and thus writings might be effaced which would often occasion serious injury, it has been proposed, with the view of frustrating such purposes, to mix a quantity of lamp-black, or charcoal, in impalpable powder, on which the acid has no effect. About one-fourth part of the quantity of the sulphate of iron employed will be sufficient. Care is necessary to have the lamp-black well incorporated with the ink.

Coloured Inks.—With the exception of red ink, few coloured inks are used for writing. They consist either of decoctions of the different dyeing materials in water, thickened with gum-arabic, or of coloured metallic oxides, or insoluble powders, diffused in gum-water. For these inks the proportion of gum-arabic may be nearly the same as for common ink.

For red ink, two ounces of Brazil-wood may be boiled for a quarter of an hour in an English pint of water. The requisite quantity of gum, and about half as much alum, are then to be added; and it has been suggested that a little madder might render the colour more permanent. Red ink may be also prepared with solution of tin in muriatic acid, and madder or cochineal.

Blue ink is made by diffusing Prussian blue, or indigo, in strong gum-water; or with any of the colouring matters now mentioned, finely levigated with the white of eggs, and then reduced to the proper consistence with water.

A solution of acetate of copper, to which gum-arabic and a little white-sugar have been added, affords a green ink.

Yellow ink may be made with a solution of gamboge in gum-water. And it may be added, that most of the water-colour cakes diffused in water answer sufficiently well for coloured inks.

China Ink.—Indian or China ink is a valuable black pigment employed in water-coloured painting, and originally brought from China and the East Indies. The result of the experiments instituted by Dr Lewis on this substance, shewed that it is a composition of fine lamp-black and animal glue. The lamp-black is to be mixed with as much melted glue as is sufficient to give a proper tenacity to the mixture to be formed into cakes. A composition of this kind, when the ingredients were in a tolerable state of purity, was found little inferior to what was imported from the East. Ivory black, and other charcoal blacks, when sufficiently levigated, answered the same purpose.

Printing Ink.—Printing ink is an oily composition, which should have the following properties. It should work cleanly and easily, without daubing the types or tearing the paper, have a fine black colour, wash easily off the types, dry speedily, and preserve its colour without becoming brown. The oils which are found to answer best for printing ink are lintseed and nut oil; and for black ink nut oil is found most suitable, but when it is employed in the preparation of red ink the brightness is diminished, in consequence of a brownish shade which the oil acquires in boiling. Printers ink is of very different qualities, and consequently very different prices. The greater part of the ink used in this country is manufactured in London; and indeed the preparation of the best kind of printer's ink is confined to a small number of individuals.

The oil is prepared by boiling it in a pot of sufficient capacity to prevent it from boiling over, and during the ebullition it is constantly stirred with an iron ladle. The vapour which rises from the surface is set fire to, and it is allowed to burn for some time, with the view, it is supposed, of separating those matters on which the greasy quality depends, and the boiling is continued for some time after it is extinguished. The oil thus prepared is called *varnish*; and when the ink is to be used in hot weather, this varnish is brought to a thicker consistency, the degree of which is ascertained when it may be drawn out like threads between the fingers, like weak glue. To increase its drying quality, and to give it body, a certain proportion of turpentine or rosin is boiled with it. But varnish which has acquired these properties by keeping answers better, for the addition of rosin renders it less easy to clean the types. Lamp-black is usually employed as the colouring matter, two ounces and a half of which, being mixed with sixteen ounces of the varnish, are ground together like paint on a marble stone or in a levigating mill.

Red ink for printing is made by adding to the varnish about half its weight of vermilion; and if a finer colour be desired, it may be greatly improved by the addition of a little carmine.

Sympathetic inks.—Certain liquids are employed for writing on paper, and are invisible till they are subjected to some process; either exposed to heat or to the action of some other chemical agent. The ancients used milk or some other viscid colourless substance for the writing, which was rendered visible by means of soot, or a similar dark powder, thrown upon the paper. The powder adhered only to those parts where the lines were drawn, and thus rendered the writing legible.

Words written with a solution of sulphate of iron are invisible, but become black when they are moistened with an infusion of galls, and assume a fine blue colour if moistened in the same way with prussiate of potash.

A solution of gold in nitro-muriatic acid, forms a sympathetic ink. The saturated solution requires to be largely diluted with water, at least with six times the quantity, and letters written with this diluted solution are invisible till they are moistened with a solution of muriate of tin also diluted, when they assume a fine purple colour in consequence of the precipitation of the gold in the form of the purple oxide. The letters become again invisible by the application of nitro-muriatic acid, and the purple colour is restored by the muriate of tin.

Letters written with a diluted solution of nitrate of silver are invisible till they are exposed to the air, when they become of a deep black colour, which is permanent.

When solutions of lead, silver, bismuth, and mercury are exposed to the action of sulphuretted hydrogen gas, they are blackened, so that they answer the purpose of sympathetic inks. Letters are written with these solutions, and remain invisible till they are moistened with the sulphuretted solution, or being acted on by the sulphuretted hydrogen gas, they appear of a black colour. Of these metallic solutions, which should be copiously diluted with water, the acetate of lead is one of the most suitable for the purpose of a sympathetic ink.

Equal parts of a weak solution of sulphate of copper, and muriate of ammonia, or sal ammoniac, form a sympathetic ink. Letters written with this ink are invisible, till they are exposed to a moderate heat, when they become of a fine yellow colour, which disappears in the cold, and is restored by the heat; and this alternate change may be repeated any number of times, provided the heat be not too great.

The sympathetic ink with a solution of cobalt was known to the older chemists. It is prepared by dissolving zaffre in nitro-muriatic acid; the solution is of a green colour; but when diluted largely with water, becomes of a pink colour. Letters or figures formed with this solution are invisible in the cold, but when exposed to heat appear of a bluish colour. When withdrawn from the heat the colour disappears, and, like the effects of the former, may be repeatedly restored by observing the precaution of applying only a moderate heat to render the writings or figures visible. With the two sympathetic inks now described, a landscape exhibiting an autumnal scene may be represented. The cobalt solution is employed for the verdure, and the solution of copper and sal ammoniac gives the yellow tints of the foliage.

Indelible ink.—Marking ink, or indelible ink, deriving the latter appellation from its property of resisting the action of soap in washing, &c. now very generally employed for the purpose of marking linen, is a diluted solution of nitrate of silver, which has been already noticed as becoming black on exposure to the air. The part of the linen on which the letters are to be written is dipped in a solution of soda and well dried. The letters are then traced with a pen, and allowed to remain for a few hours, or exposed to the sun for a short time before the linen is wetted, when the writing assumes a black colour.

INLAND NAVIGATION.—See Navigation.

INN, an establishment in a town or on a public road for the accommodation of travellers with lodging and entertainment In Eastern countries, such places are denominated caravanserays, and are little else than bare walls which afford protection from the weather. The traveller either carries with him what is necessary for himself and his attendants, or purchases it in the neighbourhood. In most civilized countries, inns are under particular regulations for the protection of travellers.

INNS OF COURT & CHANCERY, are ancient institutions in London, where young men are qualified for exercising the different departments of the profession of law. In the Inns of Chancery, attorneys and solicitors are instructed; and formerly students intended for the higher branches of the profession received a preparatory education. The four principal Inns of Court, are the Inner Temple and Middle Temple, Lincoln's Inn, and Gray's Inn; and before any person can be admitted to the bar he must attend the public halls for a certain number of years, and perform certain prescribed exercises.

INOCARPUS, a genus of plants belonging to the Decandria class.

INOCULATION is the artificial communication of a contagious disease, by which it assumes a milder form, and was originally applied to the small pox, which, being propagated in the natural way, was generally followed with a dreadful mortality, especially when first introduced into any country. Inoculation for the small pox seems scarcely to have been known before the commencement of the eighteenth century. In 1717, the son of Lady Mary Wortley Montague was inoculated at Constantinople when in his sixth year, and a favourable account of the result being transmitted to Britain, an experiment was successfully made in 1721 on seven condemned criminals in London; soon after the same success attended the inoculation of the children of the Royal family; some of the nobility adopted the same practice; and in 1726 it was introduced into Scotland. But the practice of inoculation for the small pox has been fortunately superseded by vaccination or inoculation for the cow-pox, a disease of a milder character, the effects of which, as a preventative to small pox, were announced to the world by Dr Jenner in 1798.—See Medicine.

INOCULATION, or Budding, is a method of propagating fruit-trees.—See Gardening.

INQUISITION, a tribunal established in Roman

Catholic countries, for the discovery and punishment of those who are guilty of heresy. This court was founded in the 12th century by Father Dominic and his followers, who were sent by Pope Innocent the third, with orders to excite the Catholic princes and people to extirpate heretics, to discover their number and quality, and to transmit a faithful account of them to Rome, and hence they were called inquisitors. This formidable tribunal, which was established in Spain towards the close of the 15th century, and in Portugal about 50 years afterwards, continued longer in the full vigour of its power in these countries, as well as in their foreign territories, than in any Roman Catholic state; after being abolished in Spain under the authority of the Cortes, it was revived on the restoration of the royal family.

INSANITY, or mental derangement, is a disordered state of the powers of the mind, during the prevalence of which the individual subject to it is not accountable for his actions, and is therefore required to be kept under the vigilance and restraint of others.—See MEDICINE.

INSECTS, a class of animals, of which the arrangment and natural history are detailed under ENTOMOLOGY.

INSPRUCK, the capital of the Tyrol, in the circle of Austria, stands on the banks of the river Inn; is of no great extent within the walls, but has extensive suburbs, and is conspicuous for a fine castle or palace, which was formerly the residence of the archdukes of the house of Austria. Inspruck is 68 miles south-west from Salzburg.

INSTINCT has been defined a certain power or disposition of mind, by which, independent of instruction or experience, animals are directed to perform what is necessary for their existence. The actions of the inferior animals are said to be guided by instinct, while the actions of man are directed by reason; but, it is supposed by some, that it is the same principle or power operating in all, but acting with different degrees of force, according to the wants and necessities of the individual. See MORALS and MIND.

INSTITUTE, a term in the law of Scotland which signifies the first person named of those who are called to the succession of an estate by disposition or deed of entail. Those who come after the first person are denominated substitutes.

INSTITUTES is a term applied to a book which contains the elements of the Roman law, divided into four parts, and presenting an abridgement of the whole body of the civil law.

INSTITUTIONS.

In literary matters the term institutions is employed to denote a system of the elements or rules of any art or science. But, taking it in a more comprehensive sense, it may include all those associations which have been formed for promoting the improvement and advantage of society in general, or of the parties immediately concerned, by whatever name they are designated, or to whatever object the labours of the members are directed. Institutions formed for promoting learning or science have been distinguished by the name of academies and societies; and associations constituted for commercial purposes are usually styled companies, while those which have other objects in view have different appellations, or have some epithet prefixed descriptive of their character.

I. LEARNED INSTITUTIONS.

Many of the associations which have been instituted in different countries for promoting arts and sciences, have assumed the name of Academies. The first academy of which any record is preserved was established in the eighth century by the emperor Charlemagne, and under the superintendence of the learned Alcuin; and the object of this institution was, to improve the language of the country, and to encourage a taste for polite literature.

ITALIAN ACADEMIES.

One of the first institutions for the improvement of natural and mathematical knowledge was established at Naples about the year 1560, in the house of the celebrated Baptista Porta, under the name of *Academia Secretorum Naturæ*. This society having excited the jealousy of the church of Rome was suppressed, and succeeded by the *Academy* of *Lyncei*, among whose members was numbered the illustrious Galileo. The academy *Del Cimento* was constituted under the patronage of prince Leopold, afterwards cardinal de Medicis, and included in the list of its members several eminent philosophers. About the middle of the 16th century the *Florentine Academy* was established; and about the close of the 17th century the academy of the *Arcadi* was formed at Rome. The object of these two academies was the study of poetry and *belles lettres*. The academy *Della Crusca* was instituted for the purpose of polishing and improving the Italian language. The Italian Dictionary, distinguished by its name, is a splendid monument of the labours of its members. An academy was founded at Bologna in 1690, at the suggestion, and by the exertions of a young man of the name of Manfredi, then only in his 16th year. Several volumes of commentaries have been published by this association, which, uniting with another, afterwards assumed the name of the *Academy of the Institutes*. Academies, with similar objects in view, have been established in other parts of Italy, as the *Academy of Sciences* at Sienna, instituted in 1691, and the *Academy of Sciences* at Turin, associated about the middle of the 18th century. Several volumes of Transactions have been published by both these institutions.

FRENCH INSTITUTIONS.

The French academy established by cardinal Richelieu in 1635, had for its object the improvement of the French language, and after a labour of 50 years produced a dictionary of that language. *The Royal Academy of Inscriptions and Medals* was formed at the suggestion of Colbert, and under the patronage of Louis XIV. in 1663. The object of this academy was to study and explain the ancient monuments as well as to preserve the memory of remarkable events by coins and inscriptions, and particularly those of the French nation. The *Royal Academy* of *Sciences* was established three years afterwards, on a more enlarged scale. It was composed of the most distinguished philosophers, who were divided into three classes, according to the objects of their pursuit, namely, mathematics and physics, history, and *belles lettres.* The classes of history and *belles lettres* were afterwards united to the French academy; and in 1696 the academy of Sciences received a new form, when it was composed of four classes of members, namely, honorary, pensionary, associates, and *eleves.* The pensionaries, who received salaries, and the *eleves,* were required to reside in Paris. The memoirs of this academy, from the time of its re-establishment, in 1699, till its abolition in 1793, amounted to 139 volumes 4to.

In several of the provincial towns of France similar institutions have been formed, both of a literary and scientific character, and have acquired no small degree of celebrity by the publication of their transactions.

The *Institute* of France was established in 1795, at the recommendation of Condorcet. It included the different academies, underwent some change in 1806, and was remodelled in 1816 by Louis XVIII. The *National Institute* was originally composed of the following four clases: 1. Class of physical and mathematical sciences; 2. Class of French language and literature; 3. Class of history and foreign literature; 4. Class of fine arts. It is now composed of four academies; the French academy, the Royal academy of Inscriptions and Belles Lettres, the Royal academy of Sciences, and the Royal academy of Fine Arts. The French academy, reserving its ancient statutes, with what modifications shall be deemed necessary, is to consist of 38 members. The Royal academy of Sciences shall preserve the organization and distribution into sections of the first class of the Institute, with six members attached to each, and a certain number of corresponding members. The distribution into sections is the following: Geometry, mechanics, astronomy, geography, and navigation; general physics, chemistry, mineralogy, botany, rural economy, and the veterinary art; anatomy, and zoology, and medicine and surgery. The academy of Inscriptions and *Belles Lettres* consists of forty members, with eight foreign associates, and its labours are directed to the learned languages, antiquities, and monuments, history, and the moral and political sciences connected with history. The Royal academy of the Fine Arts retains the distribution into sections of the fourth class of the Institute, and is composed as follows, viz. painting, sculpture, architecture, engraving, musical composition, with a certain number of members attached to each section.

To these academies are added classes of free academicians, who have no other privilege than that of the right of attendance. The number of volumes published by the Institute, from its first foundation to 1812, amounts to thirty-five.

SPANISH AND PORTUGUESE INSTITUTIONS.

The *Royal Spanish Academy* established at Madrid in 1714 was projected by the duke of Escalona, and had for its object the cultivation and improvement of the national language. For this purpose a dictionary was recommended to be composed, and the words and phrases used by the best Spanish writers to be distinguished from such as are barbarous and obsolete. The academicians enjoyed all the privileges and immunities of the officers in the royal palace and in the king's service.

The *Royal Academy of Portuguese History* was instituted in 1720, and consists of fifty members, with proper officers. To each of the members is assigned a portion of the civil or ecclesiastical history of the country for the purpose of illustration, as far as his researches and the means of information at his command may afford.

The *Royal Academy of Sciences* was founded at Lisbon in 1779, and is composed of sixty members distributed into three classes, viz. natural science, mathematics, and national literature. The fruits of the labours of this institution have appeared in several volumes of Transactions.

GERMAN INSTITUTIONS.

Many learned institutions have been established in Germany. The first, under the name of *Academia Naturæ Curiosorum,* was founded by Bausch, a physician, in 1652; and the first volume of their Transactions, with the title *Ephemerides,* appeared in 1670, and has been followed at different intervals by other volumes. The emperor Leopold having taken the academy under his protection in 1687, conferred upon it many privileges.

The *Royal Academy of Sciences* at Berlin was established by Frederick I. in 1700, and included, among the objects of its researches, not only physical science and mathematics, but *belles lettres.* It was afterwards divided into four classes, and embraced a wider sphere of investigation. The illustrious Leibnitz had a great share in the establishment of the Berlin academy; and the publication of their Transactions, under the title of Miscellanea Berolinensia, commenced in 1710. The most brilliant era of the Berlin academy was about the middle of the 18th century, when the Great Frederick invited, by liberal pensions and splendid honours, the most learned men of Europe to becomes its associates, and to take a share in its labours.

Numerous institutions, with similar objects, have been establised in different states of Germany, as at Manheim, Munich, Tubingen, and Brussels, and some of these have published valuable memoirs.

Russian Institutions.

The *Royal Academy of Sciences* was established in 1725, and a fund, amounting to nearly L.5000 a-year, was appropriated by the empress for its support; and for the encouragement of learned foreigners to settle at Petersburg, and contribute, by their labours, to the diffusion of science, the annual fund was more than doubled. The members of this academy are directed, by its regulations, to investigate every object that is connected with the improvement of arts and sciences; professors are appointed with liberal salaries to deliver lectures; and the labours of some of the members who have been engaged in expeditions for exploring the distant regions of the Russian empire have brought to light a great deal of curious information. To the academy are attached a library, containing a valuable collection of books and manuscripts, and an extensive museum richly stored with objects of natural history. The Transactions of this academy, amounting to many volumes, were originally published under the name of *Commentaries*, which was afterwards changed to *New Commentaries*, and at the commencement of another new series to *New Acts*.

The *Academy of Arts*, originally annexed to the academy of Sciences, was afterwards formed into a separate institution, with an annual fund of L.12,000, and admits 300 scholars, who enter at the age of six and remain in the institution till they reach their 18th year. At the age of 14 they are permitted to choose any of the following arts, namely, painting, engraving, carving, watch-making, and some other arts; and of those who have obtained four prizes, which are annually distributed, twelve are sent abroad at the expense of the government, for the purpose of improvement; and on their return, when they settle in any town, they receive an annual salary, which is continued for four years.

Swedish and Danish Institutions.

The *Royal Academy* at Stockholm was established in 1739, by private individuals, of whom the illustrious naturalist Linnæus was one. It was some time afterwards incorporated by the king, and by legacies and private donations acquired considerable funds. The Transactions of this institution have been published in a great many volumes in the Swedish language.

The *Academy of Antiquities* has been established at Upsal for illustrating the northern language, and the coins and ancient ornaments of the country; and an academy of Painting and Sculpture instituted at Stockholm, admits 400 scholars, the most distinguished of whom are furnished with the means of visiting Italy for their improvement.

In 1742, the *Royal Academy of Sciences* at Copenhagen was instituted by some learned men, who were employed in the arrangement of the royal cabinet of medals. In the succeeding year, it was admitted to the patronage of the king, endowed with a fund, and enjoined to extend their labours to natural history, mathematics, and physics. Many volumes of the Transactions of the Danish academy have been published in the native language of the country, and some of them have been translated into the Latin language.

American Institutions.

The *American Philosophical Society*, held at Philadelphia, was established in 1769 by the union of two societies which had formerly subsisted in that city. This society was incorporated by charter in 1780; the investigations of its members are extended to mathematical and physical science, commerce, husbandry, and arts and manufactures in general, and several volumes of its Transactions have appeared.

British Institutions.

The Royal Society of London, for promoting natural knowledge, was instituted by Charles II. The foundation of this society was laid at Oxford, where several learned men met weekly, for the purpose of conversing on philosophical subjects. This society was then called the Invisible, or Philosophical College. As some of the members of this institution had retired from London to Oxford in the time of the civil wars, the most of them returned to London about the year 1659, and continued their meetings at Gresham college, till they were interrupted by the public distractions of the kingdom. Their meetings were revived at the restoration in 1660. Many persons of rank and learning joined their body, and the king himself patronizing the institution granted them a charter, by which they were erected into a corporation, consisting of a president, council, and fellows.

The professed object of this society is, to "make faithful records of all the works of nature or art which come within their reach; so that the present as well as future ages may be enabled to put a mark on errors which have been strengthened by long prescription; to restore truths that have been neglected; to push those already known to more various uses; and to make the way more passable to what remains unrevealed. With this view the members of this body, from its first institution to the present time, have been occupied in experiments and observations on the works of nature and art, as well as in investigations in every department of mathematical and physical science. Of the memoirs communicated to this society, some are preserved in their repositories, and others are published under the title of Philosophical Transactions, of which a volume appears annually.

Royal Society of Edinburgh.—In the year 1718 the learned grammarian Ruddiman, with some of his friends, instituted a literary society; in 1731 another institution was formed, for the improvement of medical knowledge; and in 1739 the celebrated MacLaurin proposed to enlarge the plan of this society, by extending it to subjects of philosophy and literature. New laws and regulations were framed, additional members were admitted, and the institution was distinguished by the title of the Philosophical Society of Edinburgh. The meetings of the Society for improving Arts and Sciences, or more generally the Philosophical Society were interrupted by the rebellion in 1745, and were not renewed till 1752, soon after which time the first volume of the Transactions of the Philosophical Society of Edinburgh was published under the title of "Essays and Observations, Physical and Literary." Similar volumes afterwards appeared.

This society was remodelled and incorporated by charter in 1783, when it assumed the name of the Royal Society of Edinburgh. Like institutions of a similar nature, the society consists of ordinary and honorary members. It is divided into two classes, called the physical and the literary class, and each member at his admission is desired to state with which of the classes he wishes to be more particularly associated, although he is not precluded from attending the meetings of the other class, and taking part in all its proceedings. This society has published nine volumes of Transactions, which include memoirs on literary, mathematical, and physical subjects.

Royal Irish Academy.—From a society which was established in Dublin about the year 1782, the Royal Irish academy had its origin. The plan of this institution is very extensive, and embraces arts, sciences. literature, and antiquities. The first volume of the Transactions of this society was published in 1788, and other volumes have since appeared at uncertain intervals.

Literary and Philosophical Society of Manchester.—The institution under this title has risen to considerable reputation by the publication of a series of five volumes of Memoirs, and a new series has been commenced. An institution on a similar plan has been some years established at Newcastle. It consists of many respectable members, possesses a valuable library and philosophical apparatus; and lectures on different branches of natural philosophy are annually delivered.

Society of Antiquaries of London.—An institution under this name was formed in 1572, but having excited the jealousy of government in the time of James I. it was dissolved. The society was afterwards revived, and in 1751 was incorporated by a charter from the king, who declared himself their founder and patron. British history and antiquities are the chief objects of the enquiries and researches of this society.

An association on a similar plan was formed in Edinburgh in 1780, and incorporated by royal charter in 1783, under the name of the Royal Society of Scottish Antiquaries. Two volumes of the Transactions of this society have been published.

Asiatic Society.—For the purpose of tracing the history, antiquities, arts, sciences, and literature of the immense continent of Asia, an institution was planned by Sir William Jones, and formed in 1784. This society has published several volumes of Transactions. A similar society has been established at Bombay, and the fruits of their labours have been also presented to the world.

II. INSTITUTIONS FOR THE FINE ARTS.

French Academy of Painting and Sculpture.—About the end of the 14th century, an institution was formed at Paris, for the improvement of painting, under the appellation of of the Academy of St Luke. During the succeeding century, it received many privileges from the reigning monarchs, and was afterwards united with the society of sculptors. For some years it was neglected, and about the middle of the 15th century was revived or re-founded by some of the eminent artists of that period, and, being received under the patronage of the king, was styled the Royal Academy of Painting and Sculpture.

Royal Academy of Arts.—The institution of this academy, which was established in London in 1768, was proposed for the encouragement of designing, painting, and sculpture. The king is patron of this institution, which is under the direction of forty eminent artists, nine of whom are selected, and attend in rotation, for the purpose of superintending the performances of the pupils and giving the necessary instructions. Professors of painting, architecture, anatomy, and perspective are appointed, and deliver annual lectures on their different departments; and an annual exhibition of paintings, sculpture, and designs takes place.

Academy of Ancient Music.—This society was instituted in London in 1710, by several persons of rank, and some of the most eminent performers, for the purpose of the study and improvement of vocal and instrumental harmony. The library of this institution, consisting of the most celebrated compositions, both foreign and domestic, printed and in manuscript, was essentially useful to the members. The institution continued to flourish for many years, till some dissention having arisen, it terminated in the resignation of some of the most eminent of the practical performers. After this time, the academy became a seminary for the instruction of youth in the principles of music and the laws of harmony.

An institution with a similar object in view, and with the appellation of the *Royal Academy of Music,* was formed by the principal nobility and gentry of the kingdom, for the performance of operas composed by Handel, and conducted at the theatre in the Hay-Market, under his superintendance. A subscription of L.50,000 was raised, and the king, besides a liberal donation, permitted the society to assume the title of the Royal Academy; but, in consequence of a dispute between Handel and Senensio, one of the performers, in which the directors supported the latter, the academy was dissolved after nine years duration.

III. ECONOMICAL INSTITUTIONS.

The London Society for the Encouragement of Arts, Manufactures, and Commerce, was instituted in 1754. The chief objects of the society are to encourage ingenuity in the several branches of the polite and liberal arts, useful discoveries, and improvements in agriculture, manufactures, mechanics, and chemistry, or the laying open of any such to the public, and, in general, all such useful inventions or discoveries as may appear advantageous to trade and commerce. Premiums are proposed and given annually, either in sums of money or medals of gold or silver, for useful discoveries or inventions. This society has published many volumes of its Transactions.

A society, with similar objects in view, was instituted at Bath in 1777, and has published several volumes of its Transactions, many of the memoirs of which contain valuable experiments and observations, particularly on the subject of agriculture.

A society for the improvement of Naval Architecture was founded in 1791, the object of which is to encourage useful inventions and improvements both by honorary and pecuniary rewards.

The British Society for extending the Fisheries, and improving the sea-coast of this kingdom, was instituted in 1786; and it was authorised to raise a capital joint stock not exceeding L.100,000, to be applied to the purchase or acquisition of lands and tenements in perpetuity, for building on; and this stock is divided into shares of L.50 each.

Among economical societies may be mentioned the Dublin Society, a powerful and enlightened body, through whose exertions the state of rural economy has been greatly improved in Ireland; and the British Board of Agriculture which was established in 1794, and which has published several volumes of communications relative to the objects of the institution. In almost every district of the kingdom, institutions with similar objects in view have been formed.

The Highland Society of Scotland has similar objects in view, and expends a considerable sum annually in premiums for exciting a spirit of emulation in the improvement of every branch of rural economy. The labours of this society are not, as the name might seem to indicate, limited to the Highlands, but embrace the whole of Scotland; and they are not confined solely to agriculture and rural affairs, but have been occupied in investigating Celtic antiquities and literature. Several volumes of their Transactions have been published.

For the purpose of promoting and improving Gardening, two societies have been established of late years, one in London, under the appellation of the *London Horticultural Society*, and the other in Edinburgh, called the *Caledonian Horticultural Society*.

Savings Banks.—Numerous institutions under the name of Savings Banks, the object of which is to secure and afford interest for such small sums of money as the working classes can save from their earnings, have been established in Britain.

The first hint of an institution of this kind has been traced as far back as the year 1797, when a scheme for the management of the poor, proposed by Mr Bentham, was published in Young's *Annals of Agriculture*. One part of this plan consisted in the establishment of a Frugality Bank, although some are disposed to ascribe it to the Benefit societies which had long existed in this country. But the first attempt to bring such an institution into operation was made in the year 1803, at Tottenham, near London, by Mrs Wakefield; and of this institution an account, drawn up by that lady in 1804, was published in the fourth volume of the Reports of the Society for Bettering the Condition of the Poor. The following is an extract from this account.

"For the purpose of providing a safe and convenient place of deposit for the savings of labourers, servants, and other persons, a charitable establishment has been lately formed at Tottenham, in the county of Middlesex. It is guaranteed by six trustees, who are gentlemen of fortune and responsibility, most of them possessing considerable landed property. This renders it as safe and certain as institutions of this kind can be, and insures it from that fluctuation of value to which the public funds are liable. The books are kept by a lady, and never opened but on the first Monday in every month, either for receipts or payments. Any sum is received above one shilling; and five per cent. is given for every twenty shillings that lies twelve kalendar months; every person so depositing money being at liberty to recal it any day the books are opened; but no business is transacted at any other time.

"The money so collected is divided equally among the six trustees. For every additional L.100 a new trustee is to be chosen; so that a trustee can only risk his proportion of L.100. None but the labouring classes are admitted to this benefit; and there is no restriction as to place of residence."

In 1807, a bank for savings was established by the Rev. Mr Muckersey in the parish of West Calder; and in 1810 a similar institution was formed in the parish of Ruthwell, by the Rev. Mr Duncan, who published a detailed account of his own institution, and ably investigated the principles which may be expected to operate in such establishments. According to Mr Duncan's scheme, the contributors have a share in the management of the institution. At a general meeting, consisting of all the members who have made payments for six months, and whose deposits amount to one pound, and held once a-year, are chosen the different officers, to whom the executive operations are entrusted. The society consists of two kinds of members,—the ordinary and honorary members. Certain persons in public situations are honorary members *ex officio*; and donations to a certain amount constitute an extraordinary or honorary member. From this list of honorary and extraordinary members, the choice of functionaries is made by a general meeting, if a sufficient number be disposed to accept of office; if not, the choice is made from such of the ordinary members as make deposits to the amount of not less than two pounds twelve shillings in the year.

In some other institutions of this kind, the whole direction is placed in the hands of persons of rank or opulence, altogether independent of those who make the deposits. From this circumstance, it has been alleged, a powerful obstruction is offered to the success of the plan.

According to the scheme proposed by Mr Duncan, deposits are received in sums of one shilling; and when the sum amounts to one pound sterling it bears interest, and is always payable on a week's notice. In some of these institutions, a fixed invariable interest of four per cent. on each sum of twelve and sixpence is allowed, and the deposit is repaid when demanded, without addition or diminution. In these institutions the amount of deposits received from one individual is limited, and the sum fixed is L.25.

IV. COMMERCIAL INSTITUTIONS.

For the purpose of carrying on the affairs of commerce, associations have been formed in different countries. Such associations are usually distinguished by the name of Companies, which have been divided according to the nature of the association into *Regulated and Joint Stock Companies.* In regulated companies every person properly qualified is admitted, on paying a certain fine, and agreeing to submit to the regulations of the company, and trades upon his own stock, and at his own risk; but in joint stock companies each member shares in the common profit or loss in proportion to his share or the amount of stock which he holds.

Hamburgh Company.—One of the oldest commercial establishments in Britain, was originally styled *The Company of Merchants trading to Calais, Holland, Zealand, Brabant, and Flanders.* It afterwards assumed the more general appellation of *Merchant Adventurers of England;* and finally it was called *the Company of Merchant Adventurers of England trading to Hamburgh.* This company was first incorporated by Edward I. in 1296; established by charter in 1406 in the time of Henry IV. and confirmed with enlarged privileges by many of his successors, and particularly by Henry VII. who gave them the power of proclaiming and maintaining free fairs at Calais.

Some misunderstanding with regard to certain clauses of the charter of Henry VII. having taken place, a petition was presented to Queen Elizabeth in 1564. In the charter granted by that princess the association is declared to be incorporated anew, under the title of Merchant Adventurers of England. A second charter was granted by the same queen, and their privileges were still farther extended.

Russia Company.—The association under the name of the Russia Company was first projected about the close of the reign of Edward VI., was established at the commencement of the reign of Philip and Mary, and was confirmed by charter and act of Parliament under Queen Elizabeth in 1566. This company derived its origin from certain adventurers who were sent in three vessels on the discovery of new countries, and to find out a north-east passage to China. The persons employed in these expeditions falling into the White Sea, made up to the port of Archangel, and were well received by the Muscovites; returning home they solicited letters patent to secure to themselves the exclusive trade of Russia, for which they had formed an association. According to their charter, they had the privilege of making laws, sending out ships to make discoveries, and of taking possession of countries in the name of the king, beside the exclusive privilege of trading to Archangel and other ports of Muscovy. In the eighth year of Queen Elizabeth a new charter was granted, in which the association was denominated The Company of English Merchants for Discovering New Trades.

Iceland Company.—The association under the name of the Iceland Company was incorporated by Queen Elizabeth in 1579. Excepting Narva, Muscovy, and its dependencies, this association had the privilege of trading with all the northern states of Europe. Under succeeding sovereigns this association experienced various changes in its privileges, and, being complained of as a monopoly, was first curtailed by legal authority in 1672, and still farther restricted at the Revolution.

Turkey, or Levant Company.—This association dates its origin in 1581, in the time of Queen Elizabeth, was confirmed by charter, with additional privileges, by her successor in 1605, and was renewed by Charles II. As the name imports, the places which were included in the commercial intercourse of this company were the states of the Grand Signior, and the ports of the Levant and Mediterranean, with the exception of Italy, France, and Spain.

Company of Merchants Trading to Africa.—The trade with Africa had commenced in the year 1536, but it was not till 1588 that any association was formed. At that time Queen Elizabeth granted a patent of exclusive privilege to certain persons for ten years. After various changes an exclusive company was established, and incorporated by letters patent in 1672, under the title of the Royal African Company. The affairs of the company at last fell into great disorder, and occasioned a new association, which was formed in 1650. By the act which establishes this company they are bound to maintain all the forts and garrisons which are situated within the limits of their trade. These forts and garrisons, it may be added, are now supported at the expense of the public, and all their civil and military arrangements are made under the authority of the government at home.

Joint stock companies, which are established either by royal charter or by act of Parliament, are different in several respects, not only from regulated companies, but from private copartneries. In a joint stock company, each member can transfer his share to another person when he chooses, and he is bound only to the extent of his share; but in a private copartnery no partner can transfer his share to another person without the consent of the company, and each partner is bound for the whole debts of the company. The trade of such companies is always managed by a court of directors, which court is subject to the controul of the whole proprietors.

South Sea Company.—The regular payment of the wages of the sailors of the royal navy having been neglected in the time of the long war with France in the reign of Queen Anne, tickets for the amount were given instead of money; but as they were compelled by their necessities to sell these tickets, the avaricious persons who were the purchasers took the advantage, and demanded a discount of 40 and sometimes 50 per cent. In this way, the debts of the nation unprovided for by Parliament, and which amounted to nearly nine millions and a half, fell into the hands of usurers. A scheme was projected by government to allow the proprietors of these debts and deficiencies six per cent. per annum, and to incorporate them for the purpose of carrying on a trade to the South sea. Other sums were lent by the company to government in the reign of Queen Anne at 6 per cent.; and in the third of George I. the interest of the whole was reduced to 5 per cent., when the company advanced two millions more at the same interest. By the statute, it was declared that they might redeem all or any of the redeemable national debts; and, in consideration of this, the company was empowered to augment their capital according to the sums they should discharge. The company was also empowered to raise money on the contracts, bonds, or obligations, under their common seal, on the credit of their capital stock. But no member of the company was permitted to purchase lands or revenues on account of the corporation, or lend money by loan or anticipation on any branch of the revenue, other than such part only on which a credit of loan was granted by Parliament, otherwise he should forfeit triple the value of the money lent.

The affairs of the company were prosperous for the first five years; the value of their stock rose rapidly; and the king having purchased L.10,000 worth of stock, permitted himself to be nominated governor. Such was the state of things in 1720, when taking advantage of the above statute, the disastrous South-sea scheme was projected and carried into execution. The pretence was to raise a fund for carrying on a trade to the south seas, and purchasing annuities, &c. paid to the other companies, and proposals were printed and distributed pointing out the advantages of the scheme. The requisite capital, together with the profits that were to arise from it, was divided into a certain number of shares or subscriptions, to be purchased by persons disposed to become adventurers. To carry on the deception, the directors engaged to make large dividends, and declared that every L.100 original stock would yield L.50 per annum. The hope of such large profit caused so great a rise of the stock, that in the month of July a share of L.100 sold for more than L.800. But before the end of September it fell to L.150, by which multitudes were ruined, and such a scene of distress was introduced as is scarcely to be conceived.

The mercantile affairs of the South Sea company were not conducted with greater prudence than their stock-jobbing speculations. The first trade in which they engaged, was that of supplying the Spanish West Indies with negroes, of which, by a clause in the treaty of Utrecht, they had the exclusive privilege. But, although some of their factors and agents acquired great fortunes, the company scarcely made any profit of this trade. In 1724 the company engaged in the Greenland whale-fishery; but, after eight voyages, the loss, including capital and interest, amounted to upwards of L.237,000.

On application to Parliament in 1722, the company was permitted to divide their immense capital of L.33,800,000, the whole of which had been lent to government. The one half was to be put on the same footing with other government annuities, and not to be subject to the debts or losses of the company; the other half to remain as a trading stock, and to be subject to those debts and losses. In 1733, by a similar petition to Parliament, three-fourths of their trading stock were allowed to be converted into annuity stock; and in 1748, the company having ceased to be a trading company, the whole of their stock was turned into annuity stock.

East India Company.—The first commercial institution under this appellation was established by a charter from Queen Elizabeth; but although the ships employed in the trade belonged to the company, yet the partners traded with separate stocks. In 1612 the separate stocks were united into a common capital, which then amounted to L.740,000.

But as it came to be understood that a royal charter could not of itself secure the exclusive privilege of trade, the company was greatly harassed, and their interests much injured, by the interference of numerous private traders; and such continued to be the state of affairs during the latter part of the reign of Charles II., the whole of that of James II., and part of that of William and Mary.

In 1698, a proposal was laid before Parliament for advancing two millions to government, on condition that the subscribers should be erected into a new company for trading to the East Indies, with exclusive privileges. This scheme was opposed by the former company, who also offered as a loan to government L.700,000, nearly the whole amount of their capital; but the larger sum was preferred, and thus were two East India companies established in the kingdom; and owing it is supposed to some omission in the act of Parliament, the new company was not obliged to unite in a joint stock, so that private traders urged and exercised the right of trading separately at their own risk.

This competition did not continue long, for, in 1702, the two companies were united, and in 1708 were consolidated by act of Parliament, by the present name of the United Company of Merchants trading to the East Indies. By the same act, the capital of the company was augmented to L.3,200,000 in consequence of a new loan to government. The company now enjoyed the monopoly of the English commerce to the East Indies; and in 1743, another million was advanced to Government.

During the war in 1741, through the interference of the French as it was alleged, the company was involved in the politics and disputes of the Indian princes; but whatever was the cause of these hostile measures, their territories and possessions were greatly extended, and in 1755 it is said their revenue amounted to three millions annually.

Without entering into any details of the affairs of the East India company, and of the various changes which they have undergone down to the present time, it may be just stated that, in consequence of the vast extent of territory which they had acquired, the more immediate interference of government seemed to be necessary, and for this purpose the Board of Controul was established. The renewal of the charter of the East India company a few years ago may be regarded as another era in the affairs of this company, when the monopoly was broken up, and the freedom of trade to the East Indies permitted to ships from certain parts of the kingdom.

Hudson's Bay Company.—In the year 1670, a charter was granted to a company for an exclusive trade to the extensive regions which surround Hudson's Bay. This trade, which consists chiefly of the furs of animals with which these countries abound, has proved a profitable source of gain to a small number of persons who are engaged in it. For the purpose of carrying on this trade, several forts have been erected on different parts of the bay. See HUDSON'S BAY.

Another company called the *North West Company*, having the same objects in view, has been long established in Canada in the western parts of North America. See FUR TRADE.

The *Dutch East India Company* was constituted in 1602, and soon after established factories in different parts of India. The whole of the spice trade remained long in their hands.

The *Dutch West India Company*, which enjoyed the exclusive privilege of trade along great part of the coast of Africa, and the whole of North and South America, was established in 1621.

The *French East India Company* was established in 1664, with an exclusive privilege to trade for 50 years in all the seas of the East Indies and South sea. Their West India Company was established at the same time; and 20 years afterwards the *Mississippi Company* was formed.

V. BENEFICENT INSTITUTIONS.

THE object of institutions comprehended under this title, is, to relieve the wants and distresses of those who fall within the sphere of their operation, or to improve their moral and religious condition. For these benevolent purposes many associations have been formed.

Royal Humane Society.—This society was instituted in London, in 1774, for the recovery of persons apparently drowned, or otherwise in a state of suspended animation. The labours of this society have been attended with great success, as will appear from the statement, that not fewer than 3000 persons were restored to society by its exertions within 10 years from the time of its establishment.

Similar institutions have been formed in almost every provincial town in the kingdom; and they have been extended to the different countries on the continent and to America. Reports of the proceedings of the Royal Humane Society have been published.

Philanthropic Society.—The institution with this name was formed in 1788, and the benevolent object which it holds out is the prevention of crime, by educating and instructing in some useful trade or occupation the children of convicts, or other infant poor who are engaged in vagrant or criminal courses, and thus to lead them into the paths of industry and virtue. Presenting an asylum to the most forlorn and abject of the human race, the members of this society have have had the satisfaction of seeing those under their protection, some of whom had even been guilty of great crimes, restored to a life of decency, activity, and usefulness. No doubt can be entertained of the advantages of such an institution when it is placed under proper regulations.

Society for the Suppression of Begging.—Societies having the object in view expressed in the title have been formed in some of the great towns in the kingdom, and have been attended with very beneficial effects. Their first object is to prevent altogether the practice of common begging, which is effected by the authority of the civil magistrate. Those who are destitute, or strangers, are immediately relieved, till they are removed to those places where they have a claim for support, or are provided with some kind of work suitable to their abilities.

To the exertions of a society of this description in Edinburgh, established in 1813, the citizens are greatly indebted; for in that city common begging is scarcely known. The business of this society is under the direction of four committees, who are employed in superintending the different departments of the institution. It is the professed object of the institution to prevent indiscriminate begging on the streets, not by the harsh process of punishment, but by providing a different way for those who are thus prohibited. In this meritorious task the managers have conducted the business with great activity and judgment, and in these arduous duties they have surmounted no common difficulties. Every case submitted to them is carefully investigated, and those who are capable of working are employed in spinning, or some other occupation, and to all they administer relief suited to the necessity of the case. In all this it is obviously the object of the society to reclaim the idle, the lazy, and the profligate from their vagrant habits, and to train them to honest industry. The same society has provided a school for the education of poor children; and this part of their plan has been already attended with very beneficial effects.

Society for the Propagation of the Gospel in Foreign Parts.—This institution was formed by King William in 1701 for the purpose of maintaining and providing for the clergy employed in propagating the gospel in the colonies and plantations. With this view the archbishops, some of the bishops and of the nobility and gentry, were incorporated by charter. Before the independence of America was established, that country was the principal scene of the labours of the society. Another object of this society, to the accomplishment of which it was bound by the charter, is the conversion of the native Americans and the negro slaves.

Society in Scotland for Propagating Christian Knowledge.—The commencement of this institution is dated at the beginning of the 18th century. An association having been established at Edinburgh for the reformation of manners, their attention was directed to the Highlands of Scotland, and to the privations under which the inhabitants of those districts laboured for want of religious instruction. For this purpose a memorial was presented to the General Assembly in 1704, and being approved of, an act was passed recommending a general contribution. A charter of corporation was granted by Queen Anne, and the society was empowered at its first meeting in 1709 to nominate office-bearers. According to the scheme of management formed and adopted, it was proposed to erect and maintain schools in the Highlands and islands, in which schools all persons whatsoever should be instructed by qualified teachers appointed by the society in the ordinary branches of education, and also in the reading of the Holy Scriptures and other pious books; that the schoolmasters should be careful to instruct their scholars in the principles of the Christian reformed religion; that not only such as were unable to pay should be taught gratis, but that those whose circumstances required should have such farther encouragement as the society should think fit; that some prudent persons, ministers and others, should be nominated overseers of those schools, to see that the schoolmasters do their duty; that suitable encouragement be given to such ministers or catechists as should contribute their assistance towards the instruction of scholars remote from church, not only by catechising but preaching to them; and that the endeavours of the society be extended for the advancement of the Christian religion to heathen nations.

By liberal donations, and by an annual royal grant, which now amounts to L.2000, the capital of the society has risen to a large sum. An annual sermon is preached before the society, at the request of which it is usually published, with an appendix containing a statement of their affairs.

Society of the Sons of the Clergy.—An institution of this kind was incorporated by King Charles II. in 1678. The object of this institution is the relief of the poor widows and children of clergymen. A similar institution was formed at Edinburgh in 1790, and incorporated in 1792; and a society of the same nature was instituted at Glasgow the year before. All these institutions have in many cases proved highly useful in promoting the benevolent objects for which they were founded.

African Institution.—A society had been long established in London for the purpose of effecting the abolition of the slave trade; and, after that object was accomplished, some of the members formed themselves into another society in 1807, under the name of the *African Institution.* The civilization of Africa is the professed object of this institution, which disclaims all projects of a colonial or commercial nature, as well as all schemes of religious instruction, although neither indifferent nor hostile, but disposed to be subservient and friendly to such as engage in these attempts.

The following are the means proposed by this institution for promoting the civilization and improvement of Africa. 1. To collect and diffuse throughout this country accurate information respecting the natural productions of Africa, and in general respecting the agricultural and commercial capacities of the African continent, and the intellectual, moral, and political condition of the inhabitants. 2. To promote the instruction of the Africans in letters and useful knowledge, and to cultivate a friendly connection with the natives of that continent. 3. To endeavour to enlighten the minds of the Africans with respect to their true interests, and to diffuse information among them respecting the means by which they may improve the present opportunity of substituting a beneficial commerce in place of the slave-trade. 4. To introduce among them all European arts and improvements suitable to their condition. 5. To promote the cultivation of the African soil, both by exciting and directing the industry of the natives, and by furnishing them with seeds, plants, and implements of husbandry. 6. To introduce among the natives such medical discoveries as shall appear useful to them. 7. To obtain a knowledge of the principal languages of Africa, and to reduce them to writing, for the purpose of diffusing information among the inhabitants. 8. To employ agents, and to establish suitable correspondence, and to encourage and reward individual enterprise and exertion in promoting any of the objects of the institution.

In the proceedings of the society during the first two years, three African youths, instructed by Dr Bell and Mr Lancaster, were sent out to Sierra Leone, to communicate to their countrymen such branches of knowledge as might be most beneficial. Seeds and plants of the cotton tree, Peruvian bark, camphor, and tea-tree, and machinery for cleaning cotton and expressing castor-nut oil, were sent out, as well as seeds of hemp, flax, and plants of teak-wood; and as it appeared that the culture of the mulberry tree would be successful on the African coast, the society transmitted silk worms, for the purpose of raising silk. But for further details of the proceedings of the institution, the reader is referred to the Annual Reports.

African Association.—For the purpose of promoting discoveries in the interior parts of Africa, the African association was formed in 1788, and the first person engaged for accomplishing the object of the society was Mr Ledyard, who undertook the adventurous task of traversing the widest part of the African continent from east to west, in the supposed latitude of the river Niger. But having arrived at Cairo in Egypt, he died before the commencement of his projected journey. Mr Lucas was next engaged by the society. He embarked for Tripoli, and was instructed to proceed over the desart Sahara to Fezzan, and to return by the way of Gambia or the coast of Guinea. But the difficulties and dangers which presented themselves interrupted his progress, and his journey terminated at Mesurata. He returned to Tripoli, and soon after embarked for England.

In 1790, Major Houghton sailed for the mouth of the Gambia, with instructions to traverse the African continent from west to east. In November of the same year he commenced his journey, ascended the river Gambia to Medina, 900 miles distant from its mouth, and thence proceeding to Bambouk and the adjoining kingdom of Kasan, unfortunately terminat-

Institutions.

ed his travels, with his life, near the town of Jarra, in September the year following.

Mr Park undertook his journey, under the auspices of the society, in 1795, and pursuing the route of Major Houghton, was more successful in exploring the banks of the Niger to Sego, and to Silla, the first of the great line of populous cities which divide the southern from the northern desarts of Africa. Mr Park undertook a second journey, and left England in the beginning of 1805. In this journey he was accompanied with a guard of soldiers, several ship-carpenters to assist in the construction of boats on the rivers, and several other attendants. But, by the middle of November, about the time of Mr Park's last dispatch, every individual of the party had perished.

Mr Horneman, a young German, presented himself to the society in 1796, and having pursued for sometime the requisite studies to qualify himself to undertake a journey in Africa, he left England in July 1797, and having reached Cairo in Egypt was received under the protection of Bonaparte, and commenced his journey westward with a caravan, in September 1798. He reached Mourzouk in Fezzan in November following, and from that place his last dispatches to the society were transmitted by way of Tripoli. No farther account was ever received of this traveller, from which it is concluded that he died soon after he had sent off his last dispatches.

The last travellers to that part of the African continent were Messrs Ritchie and Lyon, who, having arrived at Tripoli, advanced to the southward, with the view of pursuing the same track that had been marked out for Horneman. But the premature death of the former frustrated the object of the expedition. For the details of these different expeditions, the reader is referred to the accounts of the different travellers already published.

Insurance.

INSURANCE, or ASSURANCE, is a contract or engagement in mercantile affairs, by which one party engages to pay the loss sustained by another party, for a stipulated premium. The common kinds of insurance are insurance against the dangers of the seas, and against fire, and insurance of debts and lives. The following are the oldest laws and regulations respecting insurance, according to the information of Beckmann. On the 28th of January 1523, five persons who had received an appointment for that purpose, drew up some regulations at Florence, which continued to be employed on the exchange of Leghorn. A short regulation of the 25th May 1537, by the emperor Charles V. respecting bills of exchange and insurance, is still preserved, in which even the fulfilling of an agreement is strictly commanded. In 1556, Philip II. of Spain gave the Spanish merchants certain regulations respecting insurance; and in 1598 the Chamber of Insurance was established at Amsterdam. The city of Middleburgh in Zealand, formed regulations with regard to insurance in 1600; and it appears that the first regulations respecting insurances in England were made in the following year.

Insurance transactions are usually executed by brokers, whose business it is to draw up or extend the policy or the document which contains the obligation of the parties, and to procure the subscriptions of underwriters, who seldom engage for more than L.300 on the same vessel. The premium is paid to the broker, who accounts to each underwriter for his proportion; and for this trouble a certain per centage is allowed to himself.

The party who comes under the obligation to indemnify for any loss that might be sustained is called the insurer or underwriter, and the compensation paid for the risk undertaken is called the premium. The business of insurance in its various branches is well understood in this country, and insurance companies have been formed in almost all the principal towns of the kingdom, and some of them which are incorporated by charter are established on a very large scale.

Interlude.

INTEREST is a certain premium paid for the use or loan of money. The sum which is lent is called the principal, and the sum paid by the borrower, or the premium, is denoted the interest. Simple interest is charged only on the sum originally lent, but if interest be charged on the interest as it becomes due along with the principal, it is called compound interest. The rate of interest has been long regulated by law. But of the propriety of such regulations great doubt has been entertained by writers on political economy, alleging, that the money-holder is as much entitled to derive what profit he can by lending his money as any other person for the goods he brings to market; and at any rate such regulations are nearly inefficient, from the little difficulty with which they can be evaded. See ANNUITIES.

INTERJECTION, a term in grammar signifying one of the indeclinable parts of speech, which serves to denote some passion or emotion of the mind.—See LANGUAGE.

INTERIM, a formulary or confession of the articles of faith which was obtruded by the emperor Charles V. upon the Protestants after Luther's death, when he had defeated their forces. It was so called because it was only to take place in the interim, or meantime, till a general council should have decided all points in dispute between the Protestants and Catholics. In this formulary were retained most of the doctrines and ceremonies of the church of Rome, excepting that of marriage, which was allowed to the clergy, and communion to the laity. This confession was rejected by most of the Protestants.

INTERLUDE, an entertainment exhibited on the stage between the acts of a play, while the actors are changing their dress or preparation is made for the succeeding scenes. In the ancient tragedy the intervals between the acts were occupied by the chorus, who sung the interludes; and the subject of these songs had always some reference to the principal characters, or to some of the incidents of the piece.

INTERMENT is the act of burying or depositing a dead body in the ground. In all countries, whether barbarous or civilized, the consignment of the body to the grave, or the destruction of it by fire, has been attended with solemn rites and ceremonies, many of which are of a religious character, and relate either to the deceased or to the surviving friends,—considered as performing a sacred duty to the one, or as affording an important moral lesson to the other.

Among both ancient and modern nations a certain period was allowed to elapse between the death and the interment, that it might be quite certain that the person was actually dead; and in some countries this period is fixed by law. In Britain, also, by a legislative enactment, the body of a dead person is not permitted to be opened till twenty-four hours have elapsed from the time of the death. These precautions, it is obvious, have been suggested, and are undoubtedly necessary, to avoid the risk of premature interment, instances of which are recorded even after apparent death for several days, followed by a perfect recovery.

INTERMITTENT FEVER is that kind of fever which returns at certain regular periods,—as the ague of this country, the paroxysms of which appear every second, third, or fourth day; and thus it is opposed to continued fever. See MEDICINE.

INTERPOLATION is that branch of mathematical analysis by which any intermediate term of a series of quantities may be found when its place in the series is given. This method was first invented by Mr Briggs, and by him applied to the calculation of logarithms. But the first general solution of the problem of interpolation was given by Sir Isaac Newton.

INTERVAL, a term in music denoting the distance between any given sound and another, or more properly the difference between the number of vibrations produced by one sonorous body of a certain magnitude and texture, and of those produced by another of a different magnitude and texture, at the same time. An interval is said to be consonant when its extremes, or highest and lowest sounds being heard at the same time, produce an agreeable sensation; and a dissonant interval is that whose extremes, heard at the same time, are each plainly discovered from the other, and produce a disagreeable effect upon the sense.

INTUITION is described to be that act of the mind by which it perceives the agreement or disagreement of two ideas immediately by themselves, without the intervention of another; and in this case the mind perceives the truth as the eye does the light only by being directed towards it.

INVERARY, the county town of Argyleshire in Scotland, stands on a small bay formed by the river Ara. This place, which is in the immediate vicinity of the splendid residence of the Duke of Argyll, was erected into a borough in 1648, and is now the seat of the county and circuit courts. The present town was built in 1773 in place of the old town, which was within the Duke's fine park. The population of the town is about 1200, and the inhabitants are chiefly employed in the herring fishery which is very abundant in Loch Fine.

In the immediate vicinity of Inverary is the duke of Argyll's castle, built of pot-stone, and one of his principal residences. It is surrounded with very extensive woods, and the diversified surface of the country presents some of the finest and most picturesque scenery.

INVERBERVIE, or BERVIE, a royal borough of Kincardine or Mearnshire in Scotland, stands at the mouth of the small river Bervie, which forms a small harbour for fishing-boats. The place is of considerable antiquity, having received its charter from king David in 1342 for the hospitality he experienced after escaping a storm at sea. The population exceeds 1000, and the inhabitants are employed in the fisheries and in domestic manufactures.

INVERKEITHING, a royal borough and sea-port town of Fifeshire in Scotland, is situated on a bay of the firth of Forth, is a place of great antiquity, contains about 1800 inhabitants, who are chiefly employed in the manufacture of salt or in the coal-trade.

INVERNESS-SHIRE, an extensive county in the north of Scotland, is bounded on the north by the Moray firth and Ross-shire; on the east and south by the counties of Nairn, Moray, Banff, Aberdeen, and Perth; and on the west by the Atlantic ocean. The length from east to west exceeds 90 miles, and the greatest breadth is about 50 miles. Several of the islands of the Hebrides, already described under that head, belong to Inverness-shire.

Aspect.—The county of Inverness exhibits an extremely diversified surface of mountain and valley, rivers and lakes, rich fields and barren moors. The different ridges of elevated land form intervening vallies, some of them of great extent, and watered by numerous rivers.

Mountains.—A large extent of the surface of Inverness-shire rises to a mountainous elevation; the highest land is in the western districts, and several of the mountains exceed 3000 feet in height. Two mountains near the course of the Spey appear to be more than 4000 feet above the level of the sea; and Ben Nevis, the highest mountain in Britain, having its base near the shore of the ocean, rears its lofty head to an altitude of 4370 feet.

Rivers, lakes, &c.—The county of Inverness is watered by numerous rivers, some of which are of great magnitude. The Ness and the Lochy flow from lakes of the same name; and the Spey with its tributary streams traverses a considerable extent of the interior of the county. Inverness-shire is studded with numerous lakes, some of which are of great extent. Loch Ness is 22 miles in length, and from one to two miles in breadth, having a depth of water of more than 100 fathoms, and in some places exceeding 130 fathoms; and some of the other lakes are from six to twelve miles in length. From the great depth of Loch Ness, the water never freezes even in the greatest degree of cold that has been observed in this country.

The great Caledonian canal, by means of which a communication will be opened between the Moray firth on the east, and the Atlantic ocean on the west, passes through Loch Ness, Loch Aich, Loch Lochy, and Loch Eil, and then falls into Loch Linnhe, an arm of the sea stretching from the sound of Mull.

Not far from the southern shore of Loch Ness, is the celebrated fall of Foyers, formed by a river of the same name, which dashes the whole body of its waters over a precipice of more than 100 feet in height. Some travellers assign to this fall a greater height, but their accounts are much exaggerated.

Natural history.—The prevailing rocks of Inverness-shire belong to the primitive class. The principal mountains are composed of granite, micaceous and argillaceous schistus. The last is wrought in some places for the purposes of roof slate. On some parts of the mainland, as well as in Skye and some other islands, excellent marble has been discovered; smokey quartz, or rock crystal coloured with iron or manganese, are often found among the alluvial soil of the mountain of Cairngorum, and hence are frequently distinguished by that name; and in the same soil are occasionally met with the beautiful gem called Scotch topaz. Some appearances of plumbago, or black-lead, have been observed near Loch Lochy, and in several places indications of lead ore. Some of the rarer British plants reward the labour of the botanist who undertakes the ascent of the more elevated tracts, and especially the lofty mountain of Ben Nevis. Among the quadrupeds of this county, the red deer and the roe are in many places abundant. The surrounding seas abound with fish; salmon are plentiful in the rivers, and the char is a native of some of the lakes.

Parallel roads.—Glen Roy, or King's Vale, lies to the south-east of Loch Lochy; along the bottom of this valley a small stream flows, and on the declivity of the mountains, about a mile distant from the river, on each side of it, are seen what are called the parallel roads, which have been long the subject of investigation among naturalists to discover their origin and use; for while some suppose that they are artificial productions, others, with more probability, assign them a natural origin. According to those who adopt the latter opinion, they mark the height of the lake which occupied the valley as it existed at different levels.

Antiquities.—The ruins of numerous ancient castles and strong holds still remain in different parts of the county. In the castle of Inverness, according to tradition, King Duncan was murdered by the usurper Macbeth. The castle of Inverlochy near Fort-William, was once a royal residence; and Castle-Stuart, from which the royal family of that name derived their origin, is in sight of the field of Culloden, which was the grave of their fortunes. Many druidical circles are seen in different parts of the county, as well as those singular edifices constructed of large stones without cement, which are supposed to have been alarm-posts of the Picts or Danes. Near Inverness is the vitrified fort of Craig Phaedrick, which was probably intended for a similar purpose.

Population.—The population of Inverness-shire in 1811 exceeded 78,000, but it is supposed that it may have decreased since that time, in consequence of some of the great proprietors having enlarged their farms, and of the emigration of many families from the west coast. The Gaelic language is spoken throughout every part of Inverness-shire; but in the town of Inverness the English language, which is spoken with great propriety, is familiar to the middling and higher classes.

Husbandry, &c.—The roads have been greatly improved throughout every part of the county. The most improved system of agriculture has been introduced in the lower districts, and all kinds of grain are successfully cultivated. In the interior of the county, an extensive system of draining has been undertaken and executed by Mr Grant of Ballindalloch. The pasture in the more elevated districts is excellent, and a valuable breed of live stock of different kinds has been introduced.

A good deal of kelp is manufactured on the west coast, and the salmon-fishing on the river Ness affords a very considerable rent. The produce is chiefly exported to the London market. The herring fishery is also a valuable branch of trade.

Forts.—Fort George, which is one of the most perfect specimens of fortification in the kingdom, is built on a low point of land which projects into the Moray firth, was begun after the defeat of the rebels in 1745, and covers a space of fifteen English acres. The ramparts are washed by the sea on three sides, and, to cut off the communication on the land side, the ditch can be filled with water. The ramparts are mounted with eighty pieces of cannon, and the barracks are sufficient for the accommodation of 3000 men. The expence of the erection of Fort George, it is said, amounted to L.160,000.

Fort Augustus, which stands at the western extremity of Loch Ness, was erected in the year 1730, is nearly surrounded by the waters of the lake and of two rivers, consists of four bastions, and contains barracks for 400 men.

Fort William, which is situated at the east end of Loch Linnhe, was originally constructed by Oliver Cromwell, and was rebuilt on a smaller scale by King William. It is of a triangular form, with two bastions mounted with fifteen twelve pounders, and a few mortars.

Inverness, which is the capital and only town of the county, stands on the banks of the river Ness, and not far from the shore of the Moray firth. The modern part of the town has spacious streets and many excellent buildings; a communication by two bridges is formed between the different parts on the opposite banks of the river. Among the public buildings are enumerated several churches and chapels, the court-house and prison, the assembly rooms, the infirmary, and the academy, which is attended sometimes by nearly 300 scholars, under a rector and six different masters.

The ruins of the castle of Inverness are still visible on a rising ground on the west bank of the river; and on the same spot stood the castle of Macbeth, in which he murdered his royal guest Duncan. This castle was occupied as barracks by the king's troops during the rebellion in 1715; but was destroyed by the rebels in 1745. Near the place where the Ness falls into the Moray firth, the vestiges of the ramparts of the fortification constructed by Oliver Cromwell are also visible. It was built of the materials of the monastery of Black Friars, and partly of stones carried from Kinloss abbey near Forres.

The population of Inverness, which has increased rapidly of late years, exceeded 11,000 in the year 1811. Coarse hempen cloth for the West India market, or for sail-cloth and sacking, and coarse woollens, especially tartans, are the principal manufactures; an iron-foundery has been established; marble cutting is carried on; and two printing-offices, one of which publishes a weekly newspaper, have been introduced. The trade is considerable; vessels of 200 tons have depth of water to unload at the pier; and grain, wool, and hides are exported.

JOANNINA, the capital of Albania in European Turkey, and the residence of the Pacha, a nominal dependent of the Ottoman Porte, is situated on the banks of a spacious lake, contains many well built houses, and has a striking appearance with its domes and minarets rising in the midst of groves of orange and cypress trees. The population is estimated at 35,000, and consists chiefly of Christians of the Greek church, Mahometans, and some Jews. The Greek inhabitants are remarkable for their industry, and are famous for their works in embroidery. At a great annual fair, which continues for a fortnight, in the vicinity of Joannina, an immense quantity of all kinds of merchandise is disposed of, as well as cattle and horses, sheep and goats, from the hills of Albania, and to be exported to the Greek islands. —Holland's *Travels*.

IODINE, a substance obtained from the kelp of commerce, and in the state of gas, of a beautiful violet colour, from which latter property the name was suggested, is one of the numerous discoveries of modern chemistry, and possesses the peculiar character of performing the part of a base and of an acidifying substance. See CHEMISTRY.

JOHANNA, one of the Comoro islands, lying in the Mozambique channel, which separates the island of Madagascar from the African continent, is of a triangular form, and about twenty miles in length. The surface presents a diversified aspect, and some parts of it rise to a mountainous elevation. All the fruits and animals of tropical regions are abundant. A bay on the north side of the island affords good anchorage, and is visited by European ships, for the purpose of obtaining provisions and water. This island is also distinguished by the name of Hinzuan, or Anzuan.

JOHNSON, Dr SAMUEL, the celebrated essayist, and distinguished lexicographer, was born at Litchfield in Staffordshire in 1709, and was the son of a bookseller in that city. In his infancy he had the misfortune to be afflicted with scrofula; and as the efficacy of the royal touch in removing that disease still formed a part of the popular belief, he was carried to London, and for that purpose presented to queen Anne. He began his education under the auspices of an old woman; was afterwards at the free school of Litchfield, then taught by Mr Hunter, and was a short time also at the school of Stourbridge, in Worcestershire, under Mr Wentworth. As he had a tenacious memory, he made considerable progress in classical attainments; but he is said to have been impatient of stated tasks, and to have spent a large portion of time, even in his boyhood, in desultory reading.

When he approached the nineteenth year of his age, he was employed to assist the studies of Mr Corbet, with whom he went to Oxford, and was in 1728 entered a commoner of Pembroke college. He spent three years at the university, and quitted it without a degree, but with a great deal of classical, ethical, and theological lore. On his father's death he became usher in the grammar-school of Market Bosworth, Leicestershire,—a situation which he soon relinquished, and went to reside in Birmingham, where he translated, from the French, Father Lobo's voyage to Abyssinia, and where he became acquainted with Mrs Porter, whom he afterwards married, and with whom he received property to the value of L.800. With this sum he thought of establishing a classical boarding school; and, with the view of carrying his design into effect, having hired a house at Edial, near Litchfield, he issued an advertisement for boarders. But this scheme failed of success. Among the small number of his pupils was the celebrated David Garrick; and as Garrick's friends had resolved that he should finish his education in London, Johnson agreed to accompany him to the metropolis. They accordingly commenced the eventful journey, carrying with them a letter of recommendation to Mr Colson, from a common friend. The object of Johnson's visit to London, as stated in the letter, was, to try his fate with a tragedy, and endeavour to get himself employed in some translation, either from the Latin or French.

Johnson's tragedy was rejected, and then he offered his services to Cave, the publisher of the Gentleman's Magazine, and for some years had no other means of support than the emolument arising from his contributions to that miscellany. He also engaged in a history of the council of Trent, of which only twelve sheets were printed, and for which Johnson received forty-nine pounds. At this period he became acquainted with Miss Carter, the translator of Epictetus; and also with the unfortunate Savage, whose life he afterwards wrote with so much elegance, spirit, and feeling. In 1738 he published "London, a Poem," written in imitation of the third satire of Juvenal, for which he obtained the small sum of ten pounds, and a large allowance of fame, but not enough to procure his election to a school to which a yearly salary of sixty pounds was attached, nor the degree of master of arts from the university of Dublin, though the degree was to render him eligible to the school, and though Lord Gower, at the desire of Mr Pope, used his influence for that favour with Dean Swift. About this time he formed a variety of literary schemes, but few or none of them were ever brought to maturity. He took an active share in the literary controversies of the time; wrote a pamphlet against the administration of Sir Robert Walpole; and contributed several biographical memoirs to the Gentleman's Magazine, among which were the lives of Boerhaave, Blake, and others, since transferred to his works. From the month of November 1740 to that of February 1743, he prepared the parliamentary speeches for the magazine,—a task, in the performance of which he drew from his own powerful intellect, and ardent feelings, much force of argument, and much splendour of language; for he composed his speeches from short imperfect notes, never having been himself in the gallery of the House of Commons but once. On one occasion, when a speech of Mr Pitt, afterwards Lord Chatham, was praised in his presence, he said, "I composed that speech in a garret in Exeter Street." After some necessary explanations, he was asked why he had dealt out his reason and eloquence so impartially. "I have," said Johnson, "saved appearances tolerably well; but I took care that the *whig dogs* should not have the best of it." While he was employed by Osborne, for daily wages, to prepare a catalogue of the earl of Oxford's library, he was observed by his employer to pause occasionally over the pages of the volumes which were passing through his hands; the bookseller objected to this delay with some keenness, when Johnson, it is said, took a folio and fairly knocked him down. This anecdote has been, however, variously told, and variously commented upon.

In 1744 he published "The Life of Savage,"—an eloquent piece of biography, which must excite regret that the subject was not more worthy of the talents of the writer. Soon after appeared Observations on the Tragedy of Macbeth, with proposals for a new edition of Shakspeare. This design was superseded at the time by Warburton's Shakspeare; but that editor praised Johnson's specimen—a favour which he ever remembered with gratitude. On the suggestion of some of the most opulent booksellers, he undertook his great philological work; and as he understood that the earl of Chesterfield was friendly to the scheme, he published, in 1747, the plan of a Dictionary of the English Language, addressed to his lordship, then secretary of State. The manuscript was transmitted, and Johnson waited frequently on him, but no patronage followed; at length his visits were abruptly and indignantly broken off. When the work was completed, Chesterfield praised it in the "World." This attempt at reconciliation drew from Johnson his memorable and highly spirited letter to that nobleman, entirely disclaiming his patronage. During the progress of the Dictionary he wrote for his friend Garrick, on his opening Drury-Lane Theatre as joint patentee with Mr Lacy, a prologue of great poetical excellence. Soon after Garrick came into the management of Drury-Lane, Johnson's Irene was put into rehearsal; and at the same time "The Vanity of Human Wishes, a poem in imitation of the Tenth Satire of Juvenal," was given to the public. Irene had a run of 13 nights, and was then entirely withdrawn; but though not well fitted for exhibition, the justness of its sentiments and the dignity of its language will make it continue long to please and instruct in the closet.

About this time Johnson established a club to meet on the Tuesday evenings. The club consisted of 10 members, among whom were Dr Hawkesworth, and Sir John Hawkins. The Rambler was also projected, and the plan communicated to his friends. The papers of this work began to be published on Tuesday the 20th March 1750; and were continued regularly every Tuesday and Saturday, for the space of two years. The Rambler was not popular at first, but it had come to a 10th edition before the death of its author. Previous to this he had become the dupe of Lauder's attack upon the literary reputation of Milton; but when the fraud was detected by Dr Douglas, he drew up for Lauder's signature a recantation in the most express terms, which he insisted upon his making public; and thus he in some measure atoned for the apparently hostile credulity which he had manifested on the occasion.

The death of his wife, in 1751, was a loss which he long and deeply bewailed; and, not long after this mournful event, he afforded in his house an asylum to the widow of Dr Williams. This lady had been left in indigent circumstances, and her destitute condition was augmented by blindness, but her learning and talents for conversation in some degree repaid the benevolence of her benefactor. The Adventurer succeeded the Rambler, and it was materially indebted for its success to the communications of Johnson, and to those of his friends whom he solicited to write. Johnson's papers in this periodical work are signed with the letter T. An edition of Shakspeare—The Idler—and the Literary Magazine or Review, next occupied his attention. In 1759 he composed the romance of "Rasselas, Prince of Abyssinia," in the evenings of one week, and sent it to press in portions as it was written, that he might raise a sum sufficient to defray the expence of his mother's funeral. This little work, thus hurriedly written, though it gives a too gloomy view of human life, may yet be pronounced unrivalled even by the manifold performances of Johnson, in the rich flow and splendid imagery of its language, and the profound philosophy and pure morality of its sentiments.

In 1762, when Lord Bute was in power, Johnson was relieved from the embarrassing poverty to which he had so long been exposed, by the grant of an annual pension of L.300 from the king. He was now enabled to indulge his propensity for cultivated conversation in a better style than he had done hitherto, and with that view became a member of a weekly club, in Gerrard Street, composed of persons eminent for talents and station. In 1765 he was introduced to Mr Thrale, an opulent brewer; and under his hospitable roof he became for several years a frequent inmate. In the same year was published his edition of Shakspeare, with a preface in the highest strain of his harmonious composition.

In 1767, Johnson was honoured with a personal interview with the king at the library of Buckingham-house. Among other things which on that occasion passed in conversation, his Majesty asked him what he intended to publish next. The author replied, that he thought he had published enough. "And so should I too," said the king "if you had not written so well." Johnson was highly pleased with this compliment to his literary merit. After this he was employed in defence of ministry and wrote the "False Alarm"—"The Patriot"—and

Johnson. "Taxation no Tyranny." In 1773 he accompanied his admiring friend Boswell to the Hebrides, and afterwards published an account of the tour, under the title of "A Journey to the Western Islands of Scotland." The interest of Lord North obtained for him, from the university of Oxford, the degree of Doctor of Laws. He visited France in company with Mr and Mrs Thrale, and on his return did his utmost to rescue the unhappy Dr Dodd from an ignominious death. His last literary undertaking was his "Lives of the Poets," which were published in 1781, and form a valuable part of English biography and criticism.

The loneliness of his situation occasioned by the death of friends, especially that of Mr Thrale, and the fear of dissolution, arising from the constitutional melancholy to which he was subject, combined their influence to render the old age of Dr Johnson peculiarly oppressive. In 1783 he was greatly alarmed by a paralytic stroke, but soon recovered from its sensible effects. Asthma and dropsy next attacked him; their inroads on his athletic and vigorous constitution were such as to make it advisable for him to relinquish the design he had formed of visiting Italy for the benefit of his health. He died in 1785, being the 75th year of his age; his remains were numerously and respectably attended to the place of interment in Westminster Abbey.

As an author, Dr Johnson was long at the head of English literature. His "London" brought him prominently into notice; and his philological researches, his critical and moral disquisitions, and his biographical narratives served to sustain and extend his celebrity. His style, which is peculiarly his own, and forms an era in the history of the English language, is characterised by gravity, dignity, and harmony, but has been blamed as too great a departure from simplicity, as abounding too much, even in the expression of ordinary matters and common-place sentiments, in pompous terms, cumbrous ornament, and measured periods. Yet we think the claim which he advances in the concluding paper of the Rambler must be conceded to him. "I have," he says, "laboured to refine our language to grammatical purity, and to clear it from colloquial barbarisms, licentious idioms, and irregular combinations. Something, perhaps, I have added to the elegance of its construction, and something to the harmony of its cadence." And we think he is eminently entitled to the higher praise of having made it "his principal design to inculcate wisdom or piety." What was the strength of his intellect, the extent of his knowledge, and the nature of his opinions, will best be learned from his writings; and what he was as an individual may be ascertained with great minuteness from the narratives of his numerous biographers, especially that of Mr Boswell. We learn from these sources, that he was subject to paroxysms of passion and seasons of morbid melancholy; that he was a man of profound and habitual devotion, of social dispositions, of wonderful powers for conversation and extemporaneous discussion,—and that, with all the ungainliness of his exterior, the dogmatism of his temper, and the number of his invincible prejudices, he yet possessed the dignity of an independent mind, and the kindness of a compassionate heart. Sir John Hawkins' edition of his works, in seven volumes octavo, was published in 1787, and that of Mr Murphy, in 12 volumes, in 1792. The Rambler, the Idler, his Poems, and some of his miscellaneous pieces, have passed through numerous editions, and are more generally diffused among the population of the British empire than the works of almost any other English author.

Johnston **JOHNSTON, Arthur**, a physician and modern Latin poet, was a native of Aberdeenshire in Scotland, and was born in 1587, was educated at Aberdeen, and having studied medicine, took a degree at a foreign university, and travelled for several years on the continent of Europe. On his return, he was appointed physician to James I. and held the same situation under Charles I. He died at Oxford in 1641.

Johnston published a collection of Latin poems, entitled, *Deliciæ Poetarum Scotorum*, in which are included some of his own productions. But he is best known as the author of a Latin version of the Psalms of David, first printed entire in 1637. He also translated Solomon's Song into Latin elegiacs, and published it in 1633, with a dedication to king Charles.

IONA, or ICOLMKILL, one of the western islands of Scotland, celebrated for its ancient monastery, and as the burial-place of some of the kings of Scotland, Ireland, and Norway. See Hebrides.

Jones. **JONES, Inigo**, an eminent English architect, was born in London in 1572, and, it is supposed, enjoyed few advantages of education. He was placed as an apprentice to a joiner, and soon distinguished himself by his talents for drawing or designing, and particularly for landscape-painting. Having obtained the patronage of the earl of Pembroke, he visited Italy, under the auspices of that nobleman, for the purpose of improving himself in the knowledge and practice of the fine arts. At Venice, where he resided, he studied the works of Palladio, and was then led to make architecture his profession. The reputation which he acquired in that city procured for him an invitation from the king of Denmark to fill the place of first architect; and having spent some years in his service, he accompanied that monarch in 1606, on a visit to his brother-in-law, James I. of England. Being desirous of remaining in his native country, he was appointed architect to the queen, served prince Henry in the same capacity, and after the death of the latter again visited Italy for his improvement.

On his return, he took possession of the place of surveyor-general of works, of which he had obtained a grant in reversion. In 1620, while he was employed in erecting the Banqueting-house at Whitehall, the king directed him to an investigation of the time when the singular structure of Stonehenge was erected, and the purpose for which it was intended. Jones ascribed it to the Romans, an opinion which has been seldom adopted by other antiquaries. Jones was also appointed, in the same reign, a commissioner for repairing the cathedral of St Paul. The repairs did not commence till 1633; and his designs for that structure were criticised as being a mixture of Roman and Gothic architecture.

Jones was much employed both at Court and among the nobility; but as he became obnoxious, from being a Roman catholic and from his attachment to the royal cause, he suffered much during the succeeding troubles of the kingdom. Having been fined as a malignant, he died, exhausted by grief and misfortune, in 1641.

Numerous buildings yet remain from the designs of Inigo Jones, among which may be mentioned Surgeon's Hall, London, Ambresbury, Wiltshire, Cashiobury in Hertfordshire, Hope-park in Northamptonshire, and the Grange in Hampshire; the front of Holyroodhouse and Heriot's Hospital in Edinburgh; and the improvements made on Glammis Castle in Forfarshire.

JONES, William, an eminent mathematician, was a native of Anglesea in North Wales, and was born in 1680; soon exhibited a strong inclination for mathematical studies, in which he made great progress; and being appointed a teacher on board a man-of-war, he attracted the notice and gained the friendship of lord Anson. While in his 22d year, he published a treatise on the Art of Navigation; and, on the return of the fleet to England, he established himself as a teacher of mathematics in London. During his residence in the metropolis, Mr Jones published various treatises on mathematical subjects, which appeared either as separate works or as memoirs in the Philosophical Transactions. He was greatly esteemed by Sir Isaac Newton, and enjoyed much of the friendship and confidence of the most distinguished characters of the times. He was promoted to the office of vice-president of the Royal Society; and having unfortunately lost the greater part of his property, which had been the fruits of his industry and economy, by the failure of a banker, he obtained, through the friendship of lord Macclesfield, a sinecure place of considerable emolument. The offspring of his marriage, which happened while he held this situation, were three children, the youngest of whom was the celebrated Sir William Jones, whose birth he survived only three years. He died in 1749.

JONES, Sir William, an eminent Oriental scholar, was born in London in 1746. The father died when his son was only three years old; and young Jones continued under his mother's care till he was in his seventh year, when he was sent to the school of Harrow; but soon after returned home, in consequence of having had the misfortune to break his thigh-bone. He was a full year absent from school, and on his return his progress was such as to make him be exhibited to strangers as an ornament to the seminary. It is said that, while at Harrow, the boys had formed the design of acting the Tempest, that they were at a loss for a copy of the play, and that Jones wrote out the whole from memory. It is, however, not very credible either that a copy of Shakspeare could not be found at Harrow, or that the whole drama in question should have been written out from an effort of recollection; the probable account of the story is, that Jones altered or abridged the play so as to suit the design of his companions.

He was entered of University college, Oxford, in his 18th year, and his mother at the same time took up her abode in the town. Before he went to Oxford he had begun to study the Hebrew and the Arabic languages; and so strong was his passion for Oriental literature that he brought from London to Oxford a native of Aleppo, and maintained him there, that he might enjoy the benefit of his instructions in Arabic and some of the other languages of the East. During the vacations he studied the Italian, Spanish, and Portuguese in London, where also he attended the schools for riding and fencing. While at Oxford he became tutor to lord Althorpe, son of the earl of Spencer; and sometime afterward he obtained a fellowship. While in London with his pupil in 1766, he was assiduous in the acquisition both of bodily and mental accomplishments, and among other pursuits he took lessons at the broad-sword from an old Chelsea pensioner, seamed with scars, to whose military anedotes he used to listen with delight.

In the year following he went with the Spencer family to the continent, where he began the study of German, translated the Life of Nadir Shah into French from an Eastern MS. for the king of Denmark, and on his return took lessons in music. In 1770 he again visited the continent; and while he bestowed a portion of his regard on the objects of interest which Italy especially presents to the attention of the classical traveller, he seems never to have for a moment relaxed his study of Oriental literature, for, among his other pursuits, we find the deciphering of Chinese enumerated.

Having returned to England, and having now reached the 24th year of his age, he commenced the study of law, with the view of making it his future profession. In reference to this he says, in a letter to a friend,—"All my books and MSS. with the exception of those only which relate to law and oratory, are locked up at Oxford; and I have determined for the next twenty years at least to renounce all studies but those which are connected with my profession." But though he was now very closely engaged in the study of law, he yet found time to defend the university of Oxford from the misrepresentations of the French traveller Du Perron, and to engage in some literary schemes. He also translated the "Greek Orations of Isæus, in cases relating to succession to doubtful property,"—a work which appeared after he was called to the bar. He was made a commissioner of bankrupts, was elected a member of the Royal Society, and maintained an extensive epistolary correspondence chiefly with Oriental scholars.

During the American war he opposed the measures of government; was, in 1780, an unsuccessful candidate for the representation of Oxford; in the same year made a visit to Paris; and, on his return, finished the translation of seven Arabian poems which had for some time been suspended. During the same period he published "An Essay on the Law of Bailments," "An Address to the Inhabitants of Westminster on Parliamentary Reform," and composed some occasional pieces of poetry.

When lord Shelburne came into power, Mr Jones was appointed to be a judge in Bengal, an office for which he had been formerly a competitor; in 1783, he received the honour of knighthood; married Anna Maria Shipley, daughter of the bishop of St Asaph, and then sailed for India, and entered on the duties of his office. In connection with these duties, he compiled a digest of Hindoo and Mahometan laws; and, as a relaxation from official avocations, engaged with ardour in the study of the Sanscrit and the other languages of India. He had a principal share in the formation of the Asiatic Society, and while he lived contributed largely to its Transactions. He translated the Hindoo drama of Sacontala, or the Fatal Ring, by Calidas, who lived about the time of Terence, and whom Sir William calls the Shakspeare of India. He published also from the Sanscrit a translation of the Ordinances of Menu,—esteemed the most ancient and the greatest legislator of the East.

But the incessant application which these pursuits imply, in the burning climate of Bengal, made rapid inroads on the constitution of this industrious and distinguished scholar. His professional duties occupied him seven hours daily during session time; and it is probable his extensive literary labours engaged him a much longer time throughout the year. His usual residence was on the banks of the Ganges, five miles from Calcutta; and he passed the vacation months in the country sixty miles distant from that city. His health in India was early affected; but in 1794, he was attacked with an inflammation of the liver, which resisted medicine, and carried him to the grave.

The learning of Sir William Jones was both profound and diversified, and has tended greatly to illustrate the origin of the most conspicuous nations that have flourished in the world. Recondite as many of his researches were, their result is yet expressed with an attractive eloquence of language. His poetry is elegant, but it has been blamed for having "too much of the florid luxury," and some of the extravagance of the East.

IONIA, a country of Asia Minor, having the Ægean and Icarian seas on the west, and Lydia and part of Cara on the east, was originally founded by colonies from Greece, was afterwards divided into twelve small states, which formed a celebrated confederacy, to which allusion is often made by ancient writers, and has been always distinguished for the salubrity of the climate, the fertility of the soil, and the genius of the inhabitants.

IONIAN ISLANDS, a groupe of islands in that part of the Mediterranean which lies between Sicily and Greece. In late political arrangements these islands are included under one government, distinguished by the name of the Republic of the Seven Islands. See Seven Islands.

JONSON, Benjamin, or Ben, a celebrated dramatic poet, was born in 1574, the posthumous son of a gentleman of Scotch descent, who suffered the loss both of his property and liberty under the bloody reign of Queen Mary. His mother, after two years of widowhood, was married to a bricklayer, named Fowler; but through the kindness of a friend the young poet was educated at Westminster school, and afterwards obtained an exhibition to Cambridge, though it proved inadequate for his support, so that he was obliged to leave the university, and betake himself to the humble occupation of his stepfather. But this employment proved so unsuitable to his inclination, that he speedily abandoned it, and went as volunteer to the army in Flanders, where, it is said, he slew in single combat an enemy in sight of the hostile armies. At the end of the campaign he returned to England, and commenced his career on the stage, both as an actor and an author. Having been about this time challenged by a player to fight a duel with the sword, he was severely wounded; but he killed his antagonist, and was thrown into prison for murder, though he was soon released without a trial. He married in his twentieth year, and two years afterward acquired a considerable share of celebrity by the comedy of "Every Man in his Humour," which rose into higher estimation when he changed the scene and the names from Italy to England. The fame of this play brought Queen Elizabeth to its representation, and provoked the envy of Marston and Decker, on whom he revenged himself in his "Cynthia's Revels," and "Poetaster." But the satire of this latter piece involved him in a quarrel with the gentlemen of the sword and the gown. The soldiers were easily satisfied, but before he got clear of the lawyers he found it necessary to appear before the Chief Justice.

Soon after the accession of king James, some satirical reflections on the Scotch nation, in the comedy of Eastward Hoe, made its authors be committed to prison. Marston and Chapman, who had framed the offensive passages, alone were seized; but as Jonson had taken a share in the other parts of the composition, he also accompanied them to prison. On this occasion a report was circulated, that the punishment to be inflicted on the poets was the slitting their ears and noses; and to save her son from this barbarous sentence, Jonson's mother is said to have resolved on giving him poison, and drinking it along with him. They were all, however, liberated from prison; and Jonson was often afterwards employed, and liberally rewarded, in the preparation of the masques, which in that shewy period were performed at court, in the palaces of the nobility, and at the feasts of corporate bodies. His Sejanus was at first unfavourably received, but when remodelled it had better success. The merits of this tragedy have been very differently estimated; but it is generally allowed, that the dignity of the Roman character is well sustained in it. To Sejanus succeeded, within the space of seven years, Volpone, the Silent Woman, and the Alchymist, which raised Jonson's reputation in the comic drama to the highest pitch. The tragedy of Catiline appeared in 1611, and is addressed to classical readers rather than to the people at large. The preface of the piece, indeed, breathes a reprehensible contempt of the popular judgment. In 1613 he visited Paris, where, it is said, Cardinal du Perron shewed him his translation of Virgil, which Ben said was *nought*, a criticism, by all accounts, equally brief and just. His next contributions to the stage were, Bartholomew Fair, in 1614, and the Devil's an Ass, in 1616. After this he made a secession from the theatre for nine years, during which he composed some of his finest masques, and obtained from the king a pension of 100 marks, in consequence of which he was called the poet laureat,—a title which, till then, had been gratuitously assumed or awarded.

In 1617 Jonson paid a visit to Scotland, the native country of his ancestors, and is said to have been kindly treated by the nobility and gentry of Caledonia, and deeply struck with its romantic scenery. He spent some time with Drummond of Hawthornden, indulging in the same conviviality which he had shared with Fletcher, Shakspeare, and the other celebrated wits of the day, at the Mermaid. Drummond construed Jonson's hard drinking and lofty boasting into intemperance and vanity; and the circumstance of notes of the poet's proceedings having been found among Drummond's papers, has made him be blamed for the perfidy of having decoyed the poet under his roof with the deliberate design of injuring his reputation, while he was carrying on a friendly correspondence with him. But the whole of the charge amounts to this,—Drummond wrote a letter with one kind sentence in it to the man whom he had described unfavourably in a private memorandum, never meant for publication.

King James appointed Jonson successor to Sir John Astley as Master of the Revels, and wished to confer on him the rank of knighthood—an honour which, as he had not the means of supporting in a proper manner, he deemed it right to decline. This reversionary grant brought him no advantage, as the incumbent survived him, but the office was enjoyed by his son. After the death of king James, who had been his steady and liberal patron he began at once to be attacked by disease and invaded by poverty. The latter evil forced him again upon the theatre, for which he produced the "Staple of News," a comedy of no ordinary merit. To this at considerable intervals were added the New Inn, the Magnetic Lady, the Tale of a Tub, and a variety of masques.

In 1625 he had a stroke of palsy, and had also a tendency to dropsy, together with a scorbutic affection inherent in his constitution from his youth. When his necessities were known at court, Charles I. sent him L.100, converted the 100 marks of salary into pounds, and added to it a yearly tierce of canary, the poet's favourite wine. Among his papers were found the Sad Shepherd, an unfinished pastoral drama—the plot and opening of Mortimer Earl of March—and Discoveries and Grammar of the English Tongue. He died in 1637, and was buried in Westminster Abbey. His friends designed to raise a monument to his memory, and a subscription to defray the expense was set on foot; but the occurrence of the civil war prevented the praise-worthy object from being carried into execution. But Sir John Young of Great Melton, Oxfordshire, in his regret that so distinguished a man should be without a memorial, is said by Aubrey, to have given one of the workmen 18 pence to cut the words, "O rare Ben Jonson," on the common pavement stone which covered his grave.

Till this poet's memory was vindicated by Mr Gilchrist and Mr Gifford, his personal character was generally regarded as a mixture of ill-nature and ingratitude. But it appears from the researches of these gentlemen, that such sweeping charges are destitute of evidence. It appears, on the contrary, that in his quarrel with Marston and Decker he was not solely to blame; that he did not requite benefits received from Shakspeare with ingratitude; that it was his intention to consign his satires on Inigo Jones the architect to oblivion, while that eminent person, when the poet was old and bed-ridden, resented the fancied affront of the poet's name having been put before his own in a masque, which they had jointly prepared; and that the charge of his being a lover of low society amounts to his being an associate of such men as Shakspeare, Beaumont, Fletcher, Seldon, Cotton, Carew, Martin, Donne, and the other wits of the age. But Jonson, like other men, had numerous faults, of which vanity, imprudence, and perhaps intemperance, seem to have been most prominent; but at this late period it is more pleasant, as well as more useful, to contemplate his excellencies as an author than his defects as a man, especially as the latter cannot now be supposed to injure the living by their influence.

JORDAENS, Jacob, a celebrated Dutch painter, was born at Antwerp in 1594, and died in 1678. It is said that he assisted Rubens in painting designs for tapestries after his sketches; and indeed, in a comparison with that illustrious artist, some critics are disposed to think that he is equal. Many of his works are still to be found in the churches of the Low Countries.

JORTIN, John, an eminent scholar and divine, was born in London in 1698, and was the son of a Frenchman who had fled to England on the revocation of the edict of Nantes. His father was a gentleman of the Privy Chamber to King William, was secretary to several admirals, and was lost at sea with Sir Cloudsley Shovel in 1707. Young Jortin was educated at the Charter-house, and completed his academical studies at Cambridge. About this time, he assisted Pope in making extracts of notes of learned commentators for the Iliad. He was elected fellow of his college in 1721, and about the same time published a collection of Latin poems, which have been admired for their elegance and classical purity. Mr Jortin having received priests orders, first held a living near Cambridge, and afterwards settled in London, when he published sermons on the truth of the Christian religion. He was afterwards employed as an occasional assistant to Warburton, then preacher at Lincoln's Inn. He was appointed preacher of Boyle's lecture, and was far advanced in life before he obtained the rectory of St Dunstan's in the East. In 1762, he was collated to a prebend in the cathedral of St Paul, and two years afterwards was appointed arch-deacon of London. He died in 1770.

The life of Erasmus is considered as the principal work of Dr Jortin. His "Remarks on Ecclesiastical History," of which he published three volumes in his lifetime, and two additional volumes appeared after his death, bear the character of profound erudition, as well as of great candour and moderation.

Josephus.

Having studied music, he composed a letter concerning the music of the ancients. His posthumous works were published in 1771 and 1773, in seven volumes 8vo.

JOSEPHUS, Flavius, the historian of the Jews, was descended from a noble family in Judea, and was born in the 37th year of the Christian era. In early life he attached himself to the sect of the Essenes, and afterwards joined that of the Pharisees. Having made a journey to Rome, he was successful in procuring the release of some priests whom Felix, the Roman governor, had sent prisoners from Jerusalem. When he returned to his own country, he was appointed, by the revolted Jews, governor of the two Galilees, and in this capacity he made a vigorous defence against Vespasian. Being taken prisoner, he was only set at liberty when Vespasian was elevated to the imperial throne, and he accompanied Titus to the siege of Jerusalem, and was sent by that general with offers of peace upon submission. After the capture of Jerusalem, he returned to Rome with the Roman general, and enjoyed a pension from the emperor. During this time he composed the "History of the Jewish War, in Seven Books," by which his name has been transmitted to posterity. His other works are Jewish Antiquities, two books against Apion of Alexandria, a discourse on the martyrdom of the Maccabees, and a treatise on his own life, all written in the Greek language. Being a spectator of what he records, his history of the Jewish war is the most interesting of his works. But a diversity of opinion exists with regard to his fidelity and accuracy.

IPOMEA, Quamoclit, or Scarlet Convolvulus, a genus of plants belonging to the Pentandria class.

Ipswich.

IPSWICH, the capital of the county of Suffolk in England, stands on the banks of the river Orwell, contains more than 13,000 inhabitants, and exports great quantities of grain for the London market.

IRELAND.

Extent, &c.

Situation and extent.—Ireland, which forms so large and important a part of the British empire, is situated in the Atlantic ocean to the west of Britain, from which its nearest point is distant about 16 miles. It lies between 51° 15′ and 55° 13′ of north latitude, and between 5° 40′ and 10° 40′ of west longitude. It is bounded by the Atlantic ocean on all sides but the east, where it is separated from Britain by the Irish sea, often, though improperly, called St George's channel. It is about 300 miles long and about 200 broad, and is computed to contain about 32,000 square English miles, or about 20,480,000 statute acres of superficial extent.

Form and aspect.—In its general form Ireland resembles an irregular lozenge, the upper angle of which is much rounded, while the lower or south-east side is nearly straight, and the west and north-west sides greatly indented and hollowed out into large bays and gulfs. The whole country is rather flat, and from its exuberance of verdure is well entitled to the appellation of the Green Island, by which it is sometimes distinguished. The highest extended part of the island, or the platform of Ireland, which traverses the bog of Allan, is not more than 270 feet above the level of the sea; and even the mountains are far inferior in height to those of Britain. The western coast is the most abrupt and hilly. This island by no means abounds with wood; but is well watered by numerous lakes and rivers. It also contains some extensive wastes or *bogs,* though its displays little of that fenny appearance so common in some of the lower flat districts of England.

Harbours.

Principal bays and promontaries.—In viewing the coast of Ireland, numerous bays and harbours present themselves, many of which are capable of receiving and sheltering vessels of the largest size. Beginning about the middle of the eastern coast, and pursuing the survey northwards and eastwards round the island, first appears the bay of Dublin, protected on the north by the hill of Howth; then follow the extensive but shallow bay of Dundalk, nearly dry at low water; the bay or lough of Carlingford, safe and commodious within, but guarded at the entrance by dangerous rocks; Strangford bay, between Hillard and Quintin-points, and connected with the extensive inlet called Lough Strangford; the well sheltered bay of Carrickfergus, a little to the north of which is a bold rocky coast, with the promontories of Fairland-point and Bengore. Cape Fairhead constitutes the north-east point of Ireland, and has an elevation of 500 feet. In its neighbourhood is the celebrated Giant's causeway, to be afterwards described. The only inlets of importance on the north shore are Lough Foyle and Lough Swilly. On the north-western coast are Donegal bay, of great extent, and containing several good harbours; Sligo bay, of a similar description, but less spacious; and Newport bay. On the west are Galway bay, bounded on the west and north by the steep and rocky promontory of Slinehead; the large estuary of the Shannon, bounded by the promontories of Loup-head and Kerry-head; Dingle bay, separated from the former by the remarkable peninsula of Dingle, whose western extremity, called Dunmorehead, is, with the exception of Iceland, the most western point of land in Europe; and the inlet called Kenmore river. On the south and south-east coast are Bantry bay, a well sheltered and capacious harbour; Beerhaven; Dunmanus bay, bounded on the west by the promontory of Mizenhead; Crookhaven; the harbours of Kinsale and Cork, the latter one of the finest in Europe; Dungarvon bay, and the harbour of Waterford. In short, Ireland can boast of above 30 harbours of the first magnitude, and 36 capable of receiving frigates.

Mountains.—Ireland exhibits no extensive chains, or very elevated ranges of mountains, but it contains some detached groupes, or insulated hills, highly interesting, either from their appearance or their productions. The most important are the Wicklow mountains, of no great elevation, but extending about 30 miles in length and 12 in breadth, and, among other valuable productions, affording gold; the mountains of Mourne, in the county of Down, one of which, called Slieve Donard, is computed to be above 2809 feet high; those of Knockandown, forming a chain between King's and Queen's counties; Mount Nephin, a solitary hill in the county of Mayo, said to be 2630 feet above the sea; Croagh Patrick, in the same county, about the same height; a considerable chain near the lake of Killarney, having one part called Mangerton, nearly 3000 feet high; the Sleevebogher, Nagles, and Galtee mountains, in the neighbourhood of Bantry bay; and a remarkable hill, three miles long and one broad, constituting the largest of the Blasquet islands, off Dunmore-head. In general, the Irish mountains are of easy ascent, and capable of cultivation to within a little of their summit, but they have few of those romantic features which distinguish the mountains of Scotland and Wales.

Rivers.—Although the rivers of Ireland be numerous, few of them are very large or afford commodious navigation far above their junction with the sea. The most important are, the Shannon, the Suir, the Blackwater, the Bann, the Liffey, and the Boyne. The Shannon rises among the hills near Swadlingar in the county of Leitrim, dividing the province of Connaught from those of Leinster and Munster, and, after a course of about 170 miles, forming, about 50 miles below Limerick, the large estuary already mentioned. In its progress to the sea, this noble river extends its waters over the flat country through which it passes, and forms several expansions called loughs, as Lough Allan, Lough Esk, Lough Ree, and Lough Derg. It is navigable for ships of considerable burden to a little above Limerick, and but for a ledge of rocks between that town and Killaloe the navigation might be extended far above the latter. The Suir or Sure rises in Tipperary, and, after receiving the tributary streams of the Nore and the Barrow, it passes on to Clonmell, below which it is navigable to Waterford, where it falls into the sea. The Blackwater has its source in a boggy hill in the county of Kerry, traverses the county of Cork, and meets the sea at Youghall bay. On the banks of this river the potato is said to have been first planted after being first brought from America by Sir Walter Raleigh. The Bann rises in the mountains of Mourne, and passing through Lough Neagh divides the counties of Antrim and Londonderry, and meets the sea a little below Coleraine. It is a considerable stream, but is prevented from being navigable to any extent by a ledge of rocks near Coleraine, forming a famous salmon leap. The Liffey commences in the north of Wicklow, takes a circuitous route through the counties of Kildare and Dublin, and dividing the metropolis falls into Dublin harbour. This river also has a remarkable salmon leap. The Boyne, celebrated as the scene of the victory obtained by William III. over the forces of James II. rises in King's county, and flowing through the middle of East Meath enters the sea at Drogheda.

Lakes.—Exclusive of the large inlets from the sea called loughs, Ireland posseses many inland lakes, of considerable extent and great picturesque beauty, particularly Lough Earne, Lough Neagh, Lough Corrib, and the lake of Killarney. The first is situated in the county of Fermanagh and province of Ulster. It sometimes assumes the form of a river, rising from a small lake in the county of Longford, and taking its proper expanded character a little to the north of Belturbet, whence it again flows in a stream to Enniskillen, and once more expands into a lake of considerable length between Enniskillen and Churchhill. Its expanded portions occupy about 35 miles in length by a medium breadth of about 10 miles, and contain both together above 300 small islands. Lough Neagh is situated in the province of Ulster, in a central district, bounded by five counties, Down, Antrim, Londonderry, Tyrone, and Armagh. It is much more compact than the former, and nearly of a square form, with two considerable bays on its eastern margin. It is about 15 miles long and above seven broad, and its area is estimated at above 58,000 acres, though it is probable from some old maps that it was formerly much more extensive. Its coasts are generally flat, and bare of wood. It is supplied by the constant influx of several rivers, especially the Bann and the Blackwater. Lough Corrib in the county of Galway is longer, but narrower than Lough Neagh, being about 20 miles from its north-western termination, which is its broadest part, though its medium breadth scarcely exceeds four miles. From its situation between Galway bay and Killery harbour, a useful communication could be easily made between those two inlets, for the purposes of inland navigation. The lake of Killarney, the most celebrated for its beauty and scenery of all the Irish lakes, has its situation among the mountains of Kerry, which form a majestic border on its south-west coast. It properly consists of the three lakes called the Lower lake, Mucross lake, and the Upper lake, and containing together about 4360 acres. Nothing can exceed the romantic and picturesque beauty exhibited by these lakes. On one side they are overlooked by lofty mountains, while on the other they are bordered with hanging woods displaying every variety of shade, and their bosom is adorned with numerous verdant islands, resounding with cataracts and echoes reverberated from the neighbouring hills.

Bogs.—Among the native features of Ireland must be particularly noticed its bogs,—those extensive wastes which, though they defy the industry of the farmer, supply the neighbourhood with abundance of fuel. The extent of these bogs is astonishing; for it is ascertained, by actual survey, that they occupy at least 2,330,000 English acres; and that one county alone, Cavan, contains not fewer than 90 bogs, comprising among them above 17,000 acres. The most boggy parts of the island form a belt across its middle from east to west, growing wider as it extends in the latter direction, so that the western counties are in general the most boggy. What is called the Bog of Allan is not one continuous bog, but a series of morasses, commencing in the county of Kildare and extending to the Shannon, with many intervening patches of cultivated ground. These bogs are of very various appearance and nature. Some of them are covered with herbage, and, though perfect quagmires, seem firm and safe, and tempt the unwary traveller to cross them, perhaps to his destruction; though, as they are generally intersected by a line of firmer land, they are sufficiently safe under an experienced guide; others are less deceitful, and shew a surface of mud and water covering the peat below; while a few, though consisting chiefly of wet and marshy ground, are rendered passable by the matted roots and stems of the plants that grow in them. Many of them are very picturesque from their diversity of surface, varied into hill and dale; and some are even mountainous. Large trunks of trees in a state fit for building are often found imbedded in the moss.

Canals.—As the natural inland navigation of Ireland is so much interrupted by rocks and waterfals, recourse has been had to artificial means of communication. Several canals have been formed in the course of the last fifty years, particularly the Grand canal across the island from Dublin harbour to the Shannon; the Royal canal running more northerly between Dublin and Mullingar in West Meath; and the Newry canal from Carlingford bay to Lough Neagh. This last facilitates the conveyance of coals, while the other two are employed chiefly for the carriage of peat.

Soil.—The general soil of Ireland is rather peculiar, as it possesses less variety than that of England or Scotland. The stiff, tenacious, retentive clay, the dry sand, and the sharp gravel so common in these countries, are there almost unknown; and the chalky soil so frequent in the south-east of England is equally rare. The prevailing soils are either red peat, or loam of various kinds. The first is unproductive till drained and manured; the last is in general fertile, but thin, and reposes on a rocky bottom. Sometimes it is of a clayey nature, though not so tenacious as in Britain; but in general it is light and easily worked. The richest loams are found in the counties of Meath, Roscommon, Limerick, and Tipperary; and the districts on the banks of the Shannon are very fertile, from the alluvial soil, or *caucas* land as it is called, of which they are chiefly composed.

Climate.—From its comparative smallness, and the immediate vicinity of the Atlantic, which is scarcely more than 60 miles from the centre, the climate of Ireland is moister but more temperate, especially in the western and south-western counties, than in the corresponding parts of Britain. A week seldom passes without three or four rainy days, a circumstance which is peculiarly favourable to husbandry, as it continually supplies the shallow soil with sufficient moisture. South and south-west winds are very prevalent during winter, westerly winds in summer, and north and easterly in spring. Tempests are frequent from November to January, and in the mountainous regions are often very violent. Snow seldom lies long on the coasts, and even in the interior, where the air is proportionally colder, a month's continuance of snow on the ground is uncommon, especially if the sub-soil be a limestone rock. But, owing to the humidity of the atmosphere in winter, the air often feels chilly when its temperature, as indicated by the thermometer, is by no means low. The mean temperature throughout the year on the coast is seldom less than 47°, or greater than 51° of Fahrenheit, but in the interior it is often considerably lower. Comparing the temperature of Dublin with that of London at different seasons, it is observed that the spring and summer are generally cooler, and the autumn and winter warmer in the former than in the latter city.

Productions.—The natural history of Ireland, though in general very similar to that of Britain, presents many interesting circumstances. The principal minerals are granite, limestone of various species, basalt, coal, several siliceous stones, gold, and ores of silver, copper, lead, iron, cobalt, and tin. Granite is supposed to form the principal sub-stratum of the whole island, especially near Dublin, in the Wicklow mountains, and in the counties of Kilkenny and Down. It appears of various shades, as grey, red, and yellow, and is commonly employed in building or paving. Limestone is very abundant, except in the counties of Wicklow, Wexford, Antrim, and Tyrone. It is found reposing on granite on the shores of Dublin bay, and generally forms the immediate sub-stratum of the soil on the banks of the Barrow, Blackwater, and several other rivers, as well as in many parts of the interior. It occurs, of a fine white granular texture, and capable of receiving a good polish, at Ardbraccan in Meath; and blue limestone, little inferior to marble, is obtained in Derry. In Kilkenny, too, limestone of very close grain and various colours, especially black, white, and pale red, is found, and even marble, scarcely less valuable than what is brought from Italy. The quarry from which it is procured is called the Black Quarry, and the marble has a black ground with white spots and veins. Common marble occurs in some other counties, as Kerry, Cork, Armagh, and Down. Besides, the Giants Causeway, which is entirely composed of basaltic columns, this rock forms a principal part of several promontories, as Capes Fairhead, Bengore, and Pleaskin, all in the neighbourhood of the Causeway. It also extends along the coasts from the Bay of Carrickfergus to Lough Foyle, and inland as far as Lough Neagh. It assumes various shapes and directions, being in some places regular, in others amorphous. Sometimes it is seen in a perpendicular, at others in an oblique direction, and occasionally it takes a curved form. Coal is found in several districts, especially in the counties of Kilkenny, Queen's, Leitrim, Antrim, and Tyrone. The most important coalleries are at Castle Coomer, near Doomane in Queen's county, employing about 600 colliers, and producing annually about 40,000 tons of coals; at Ballycastle in Antrim; near Dungannon in Tyrone; near Arigna in Leitrim; and near the town of Kilkenny. Veins of coals have also been found in Tipperary, and in the barony of Duhallow in the county of Cork, extending to Kerry. The best coals are those of Castle Coomer and Kilkenny, but in general the Irish coal is inferior to that of the North of England. The principal siliceous stones found in Ireland are free-stone, quartz, garnets, beryl, Vesuvian, amethysts, and Kerry-stones, similar to those of Bristol. Slate also occurs in several parts, especially at Killarney; and very fine porcelain clay, equal to the finest found in England, is obtained in the south-western part of the county of Wicklow.

Gold, in the metallic state, of considerable purity, but in small quantity, has been found on the declivity of a mountain six miles west of Athlone in the county of Wicklow, and in a mountain stream descending from Cronebane, one of the Wicklow hills; and, for some time after the discovery, great hopes were entertained that it would prove a lucrative production to government; but these hopes have been frustrated, and the search for gold in this district has been nearly abandoned. Silver has been obtained in considerable quantities from the lead mines of Antrim, Sligo, and Tipperary; but for many years it has become deficient. The principal copper-mines are at Ross-island and Mucross, in the lakes of Killarney, at Cronebane, and Ballymurtagh in Wicklow; and the same metal has been found in the counties of Dublin, Clare, Meath, Waterford, and Cork; but few of these mines have been found sufficiently productive to defray the expense of working. Several lead-mines occur, particularly in the counties of Wexford, Wicklow, and Donegal, but very few are at present wrought. Iron, as in Britain, is the most plentiful metal, though but little of it is obtained from the native mines. Tin ore is very rare, and has been found chiefly in the Wicklow hills in searching for gold. Cobalt ore is also uncommon, but has been occasionally met with in the copper mine at Mucross and in the hill of Howth. In this latter situation, manganese, in the state of grey ore, has also been detected.

Mineral waters.—Under this head may be noticed the mineral springs of Lucan, near Dublin, at Swadlenbar in the county of Cavan, of Johnstown near Urlingford in Kilkenny, and at Mallow in the county of Cork. These springs are chiefly impregnated with iron, and are resorted to by invalids for the cure of debility and some other chronic complaints.

The *vegetable* productions have been but little attended to, but there is no doubt that many rare and interesting plants are to be found among the sequestered hills and bogs. Formerly there were extensive forests in the island, but they are now greatly reduced, and confined chiefly to the county of Fermanagh, the glens of Wicklow, and the mountains of Killarney. In the first situation ash, and in the two other oak, is the prevailing timber; but in the other districts oak is not common, and ash is seldom seen elsewhere, except in the counties of Cavan and Tyrone. In the whole county of Kilkenny only about 1800 acres are planted, and in Clare not more than 780 acres. Among the cliffs of the mountains that overhang the lakes of Killarney, the *arbutus unedo,* or strawberry tree, and *pyrus aucuparia*, or service tree, flourish in great beauty, and by their splendid blossoms and red berries add greatly to the magnificence of the scenery. On the hills of Sligo, and in some other elevated spots, the *Saxifraga umbrosa*, or London pride, is indigenous, and many of the heaths are adorned with that beautiful species of *erica* called *E. Daboecii.*

The *animal* kingdom presents few peculiarities. Wolves, once so common in the island, have been exterminated since the beginning of the 18th century; and the Irish greyhound, or wolf-dog, formerly employed in hunting those ferocious animals, from neglect of the breed, has nearly shared the same fate. The moosedeer, which appears to have been in early ages a common animal in Ireland, is now found only in the fossil state in the depths of the bogs, where vast horns, measuring 14 feet from tip to tip, and sometimes nearly whole skeletons of that enormous species, are occasionally dug up. Even the common deer is rare in the wild state, and moles are unknown. Among the birds, the eagle is seen in the mountainous districts, and most kinds of game are sufficiently abundant; but magpies are not frequent, and are said to have been unknown before the 18th century. Most kinds of British fish are found off the coasts and in the waters of Ireland. The herrings are very large and fine. Salmon abounds in many of the rivers, particularly near Londonderry, Coleraine, Dublin, Waterford, Limerick, and Drogheda, in the Bann, the Earne, the Blackwater, and the Liffey. The lakes produce very large pike, trout resembling char, eels, and perch; and the bay of Carlingford is noted for large and excellent oysters. Few reptiles are found; frogs are uncommon; and toads and serpents, at least of the venomous kind, are entirely unknown.

Natural curiosities.—Among the natural curiosities must be particularly noticed some of the remarkable cataracts that obstruct the course of the principal rivers and the Giants Causeway. The principal waterfals are in the rivers Shannon, Bann, Earne, and Liffey. That on the Earne, a small river that flows from the lake of the same name, is situated near the town of Ballyshannon, and forms one of the finest salmon leaps in the island. As the tide from Donegal bay flows up to this ledge of rocks, its perpendicular elevation at high-water is seldom more than three feet, but at low-water it is often 18 feet above the bed of the river; so that the salmon, which are then ascending the stream, are obliged to take prodigious leaps, to overcome at once the great height of the ledge and the impulse of the water rushing down its sides. But a still more majestic cataract is seen near Ross-Macowen, about 14 miles from Bantry bay. It issues from the summit of a small rocky mountain called Hungrahill, where is a lake supplied by numerous small streams. Frequently the lake overflows, and pours down its accumulated waters from the height of 700 feet in a vast sheet, at least ten yards broad, which, dashing from rock to rock, and sparkling and reflecting in the rays of the sun, presents a grand and brilliant spectacle.

The *Giants Causeway* is situated below Ballycastle, and occupies about a mile and half along the north-eastern coast, from the promontory of Fairhead to Port-Naganye, though this name is generally restricted to a natural mole, or pier, which extends for about 200 yards into the sea, and is then gradually lost in the waters of the strait between the mainland and Rathlin island. This grand example of basaltic rocks is composed chiefly of three principal ledges, rising successively one above another to the height of 200 feet above the level of the sea. They are denominated the Great, Middle, and Little Causeways, and are formed of perpendicular columns, generally five or six-sided, fitted to each other like joints, by a convex part at one extremity, and a corresponding concavity in the contiguous one. The compound columns are of various lengths, from 25 to 45 feet, and the component joints are in some places not more than eight inches, and in others nearly two feet long, and from 16 to 20 inches in diameter. The whole range forms a majestic cliff, indented into several hollows, which are dignified with the titles of bays or ports, though each indentation be of trifling extent. It is probable that the lower bed of columns extends a considerable way into the sea, and tradition relates that it once joined the Scottish isle of Staffa.

Divisions.—The whole island is divided into four provinces; Ulster in the north, Leinster in the east, Connaught in the west, and Munster in the south and south-west. Ulster comprehends nine counties, viz. Antrim, Londonderry, and Donegal, in the north; Down, Tyrone, and Fermanagh in the middle; and Armagh, Cavan, and Monaghan in the south. It is divided from the adjacent provinces by a very irregular line, passing from the south side of Donegal bay, skirting the counties of Fermanagh, Cavan, Monaghan, and Armagh, and terminating in the east, at the head of Carlingford bay. It is computed to contain 8375 square English miles, besides about 58,000 acres occupied by Lough Neagh, and is subdivided into 53 baronies, and 322 parishes. Leinster comprises 12 counties; Louth, East Meath, West Meath, and Longford, in the north; Dublin, Wicklow, King's county, Kildare, and Queen's county in the middle, and Wexford, Kilkenny, and Carlow. Its area is computed at 7360 square English miles, and it contains 97 baronies and 992 parishes; it is divideh from Connaught by the Shannon and Lough Ree, and from Munster by an ideal line, commencing in the west, at the head of Lough Dreg, and coasting King's and Queen's county and Kilkenny, and terminating at the head of Waterford harbour. Connaught, though little inferior in extent to Leinster, as it comprehends about 7191 square miles, contains only five counties, Antrim, Sligo, Mayo, Roscommon, and Galway. It is separated from Munster by a short irregular line, passing from the south of Galway bay, between the counties of Galway and Clare, to Lough Derg. It is subdivided into 41 baronies, and 296 parishes. Munster is the largest of the four provinces, including an area of about 9276 square miles. It contains six counties, Clare, Tipperary, Limerick, Kerry, Cork, and Waterford, and is subdivided into 59 baronies and 816 parishes.

Islands.—Considering the great extent of sea-coast in this part of the British empire, the islands are few, small, and of little importance. Off the eastern coast lie Dalkey island, forming the southern limit of Dublin bay, Lambay, the Copland isles, and Magee. Off the northern coast the islands of Rathlin or Raglin, and Tory; off the north-west and west are the islands of Arran More, Achill, Clare, Killery, South Arran, Blasquet, Valencia, the Skilligs, and Dursey; and off the south coast are Cape Clear, Bearhead, and the Saltees islands.

Population.—The population of Ireland has been variously estimated by different writers. Some have stated it so low as 3,000,000, while others have computed it at 5,000,000. This last estimate is formed, by supposing that each inhabited house contains on an average six persons; and as the number of houses, according to late returns, amounts to about 702,000, the population is supposed to be not less than 4,340,000, and is conjectured considerably to exceed that number. Of this population a very large proportion consists of paupers, or of labourers, or mechanics of the lowest order; and the number of nobility, and higher gentry, who actually reside in the island, is comparatively very small. In no part of the British dominions are found so many paupers and mendicants as in Ireland. Considering the great extent occupied by bogs and lakes, Ireland must be regarded as a very populous country, especially when compared with Scotland; as, taking the average of the whole island, it contains 156 individuals in each square mile.

Inhabitants.—The native Irish, descended from the original Celtic tribes by whom the island was probably first peopled, and who still use the Celtic language, form by far the greater part of this population, especially in Connaught and Munster; but in several districts they are intermingled with English and Lowland Scottish families, and occasionally is seen a distinct race of people, apparently of Danish extraction, characterised by a peculiarity of dress, dialect, and manners. The native Irish are in general tall, stout, and well made, with muscular limbs and an expressive physiognomy. Their national character displays a mixture of good and bad qualities, natural to a people who possess few opportunities of civilization and refinement. They are brave, generous, and sincere, courteous and gallant among their equals; respectful to their superiors; hospitable towards strangers; grateful for benefits received, and quick to resent an insult or revenge an injury; of a lively imagination, passionately fond of poetry, music, and dancing; cheerful in their disposition, and disposed to conviviality; they possess a readiness of wit and repartee, and a natural flow of eloquence, which render them both interesting and agreeable. On the other hand, they are generally indolent and careless, thoughtless of the past and often reckless of the future, improvident in their economy, untidy in their houses and persons, superstitious and even bigotted in matters of religion, hurried and frequently confused in their actions and expressions. The natural propensity to blundering so generally imputed to the Irish, though ably combated by a celebrated writer, is too common to be overlooked. By some it has been attributed to a confusion of intellect, while others have ascribed it to a "precipitancy of manner, and proneness to exaggeration, introducing into their conversation style a kind of hurry and confusion."

Agriculture.—Previous to the commencement of the 19th century, the state of agriculture in Ireland appears to have been rude and imperfect, and was the subject of criticism and ridicule with agricultural and scientific travellers on all occasions. Tillage was not well understood, and practised in a slovenly manner, owing partly to the ignorance and prejudices but still more to the indolence of the farmers, and the little encouragement afforded them by their landlords. The system long pursued by the British government, of laying restrictions on the exportation of grain from the island, also had considerable influence in preventing or checking the improvement of its husbandry. But many of these causes have of late been removed. The farmers have become more intelligent and enlightened, and, instead of practising the old custom of fallowing, have adopted the more active and productive method of a rotation of crops; the great landholders have, in general, been convinced that their own interest materially depends on the encouragement of their tenants; and since the Union, Ireland has been put on an equal footing with the other British dominions in respect to its commercial intercourse. Hence, during the last 20 years, agriculture in that country has been greatly improved, and, in particular, tillage has been increased in extent at least one fourth, and has become considerably more productive. Throughout a great part of the island, wheat is little cultivated, the prevailing crops being oats and barley; and in turning up the ground, the plough is either seldom employed, or is so rudely constructed, and managed so awkwardly, as to occasion much unnecessary labour and loss of time,—so that as the tillage farms are generally very small, and the soil shallow, digging with the spade is frequently preferred to ploughing. Tillage husbandry is most imperfect in the northern parts of the island, and has improved chiefly in the middle and eastern districts, where the farms are generally larger, exceeding 90 or 100 acres, and where wheat is a standing and productive crop. The mode of thrashing and winnowing the grain after it is cut down, is also in many parts very rude and imperfect. Grain is usually measured by the barrel, containing from 14 to 20 stone weight, according to the nature of the grain. The Irish wheat is generally coarse, but the oats and barley very good. Little attention is paid to hoeing and weeding.

Potatoes and *flax* are much cultivated throughout Ireland. The former are excellent, and are generally planted in drills, and stored for the winter in pits lined with turf. The latter is produced in great quantity in the province of Ulster, and is generally cultivated, except in the counties of Wicklow and Wexford. In some years, 100,000 acres have been sown with flax.

Dairy husbandry and *grazing* are carried on to a much greater extent than tillage. Great quantities of butter are made, and in some districts, particularly Carlow, its quality is very fine; but little cheese is produced. The grazing land is generally distinct from the arable, and is seldom connected in large farms, but is let out among a number of persons of the same district in partnership leases. The breed of cattle most esteemed is a cross between the native Irish and the Staffordshire. Multitudes of sheep are fed, especially in Galway, Roscommon, Clare, Tipperary, and Limerick. The sheep are generally of a large size, with long wool, and without horns, but on the Wicklow hills a peculiar breed of fine wooled sheep prevails. The native horses seldom exceed 15 hands in height, but are very useful, hardy, and sure footed. Goats and hogs are very common throughout the island. The former are confined chiefly to the cottagers, many of whom use no other milk. The hogs are tall, long, and thin, and are so general that at least one is found in every cabin. Bees are generally kept on some of the dry hilly districts, where they thrive well, and produce excellent honey. Poultry forms a necessary stock among all the small farmers, and generally constitutes a part of their rent; turkeys, in particular, are numerous and large.

Rents are of course very various, and often high, especially for potato-ground, which sometimes produces to the proprietor from six to ten guineas the acre. Besides the stated rent, the farmer is commonly bound to assist the landlord, or the middleman, his representative, with gratuitous labour and a certain proportion of *duty* eggs and fowls.

Manufactures.—The most important manufactures of Ireland are those of linen, cotton, and woollen goods, and gloves, to which may be added the distillation of whisky. The linen manufacture, which was first established by Lord Strafford in the early part of the reign of Charles I. is carried on to a great extent, and prevails over almost every part of the island, except the counties of Wicklow and Wexford. It of course employs a great number of hands, flax-dressers, spinners, weavers, and bleachers, and these departments are generally distinct, though sometimes all but the last are filled by the same family. Linen goods of every quality, and almost every description, from the coarsest Osnaburgs and sheetings to the finest lawns, and cambric worth a guinea the yard, are manufactured; and as a bounty is given by government for their encouragement, these articles are a source of considerable profit to the country. Spinning is generally performed with the common wheel, as it is found that in this way much finer yarn is produced than by the aid of more complex machinery, and the price of labour is so low that the employment of the latter is less an object of consideration than in Britain. The bleaching establishments are often very extensive, and employ a considerable capital, especially in Londonderry, Fermanagh, Down, and Sligo; some of these bleachers send out annually from their greens about 5000 pieces, valued at not less than L.10,000. Of the finer fabrics, diapers, lawns, and cambrics are manufactured principally at Belfast, Lisburn, and Largan. The manufacture of cotton goods, though of very recent establishment, is now become pretty general. It commenced in 1784 at Belfast, which is still its principal centre, and gradually extended to Louth, Dublin, Kildare, Wicklow, and Wexford. Although carried on chiefly by machinery, it employs many thousand persons, and as the wages are higher it is more profitable to the labouring classes than the linen manufacture. The spinning, and sometimes the whole process is conducted in the large manufactories; but in some places the yarn thus spun is given out to private weavers to be wrought into webs. Besides the counties above mentioned, where both calicoes and muslins are made, manufactories for the latter are established in the counties of Cork and Down, and in Queen's county.

The woollen manufacture has never flourished in Ireland, and, as a trade, is confined to a very few districts, as Kilkenny for blankets, Dublin, Carrick, and Kildare for broad cloths, Wicklow for flannels, and Cork for stuffs; but in general the wool produced on the sheep-farms is carded, spun, woven, and dyed by the farmer and his family, and is made into friezes, linseys, petticoats, coarse blankets, and stockings.

Ireland has long been famous for excellent gloves sold under the name of Limerick, though not made exclusively in that county. They are manufactured from fine calves' skin.

The distillation of ardent spirits has for many years been carried on to an amazing extent, especially in private. It appears that, in the course of five years, not fewer than 13,000 illicit stills have been seized by the officers of excise, and it is calculated that, were the legal duties to be obtained on all the spirits distilled in Ireland, they would amount to above L.2,000,000 Sterling per *annum*, while the licensed distilleries scarcely produce more than a fourth part of that sum. The latter are established in most parts of the island, particularly at Limerick, Cork, Dublin, Ross, and Drogheda. So extensive are some of these establishments, that in one distillery 17,000 gallons of spirits have been produced every week for eight or nine months, or about 153,000 gallons in one year. If these statements be compared with the quantity of malt liquor brewed in Ireland, which has never exceeded 100,000 barrels in one year in the most extensive brewery, some idea may be formed of the predilection of the Irish commonalty for their favourite *usquebaugh*. The largest breweries are at Cork, where great quantities of malt liquor are made, chiefly for the use of the shipping.

The *commerce* of Ireland appears to have much increased since the Union, and is now extended to America and the West Indies, as well as France, Spain, and Portugal. The exports consist chiefly of linen, wool, butter, whisky, salt provisions, corn, hides, and tallow, porter, linseed, and cotton goods; in return for which are imported from Britain, cotton, wool, woollen goods of every description, silk, and silken stuffs, hats, teas, iron, cutlery and other hard-ware, glass and earthen-ware, articles of cabinet-work and upholstery, drugs, dye-stuffs, bark, seeds, spices, and other groceries; cheese; coals; hops; from America, pearl-ashes, tobacco, and rice; from the West Indies, sugars, rum, and coffee; from France and Spain, wines, brandies, fruits; from Portugal chiefly wine.

The current value of money in Ireland differs a little from the value in England. The same coins are used in both countries; but those coined in Ireland are smaller, and of course of less value. Hence English coins are estimated in Ireland above their nominal value; a shilling passes for thirteen pence, and is commonly called a *thirteen;* a sovereign, when exchanged, will produce L.1, 1s. 8d., and a guinea L.1, 2s. 9d. Irish. On the other hand, as the Irish coins pass for their nominal value in Britain, it is sometimes made a profitable traffic to carry over British gold, and bring back its amount in Irish copper.

Government.—Although the government of Ireland be now vested in the king and imperial parliament of the United Kingdoms, a lord-lieutenant still resides at Dublin as the immediate executive, and is assisted by a council, a principal secretary of State, a private secretary, an under-secretary of the civil and another of the military department. Other resident functionaries are, the commander of the forces, the constable of Dublin castle, the lord high chancellor, the master of the rolls, and the clerk of the council. The ordinary law business is transacted by the lord chief-justice and three judges of the court of King's Bench; the chief-justice and three judges of the court of Common Pleas; a lord chief-baron and three barons of the Exchequer; a judge of Admiralty, an attorney and solicitor-general, and a king's advocate. There are also a board of Excise and a board of Customs, each under the superintendence of seven commissioners. The nation is represented in parliament by four spiritual and 28 temporal peers, and by 100 members of the House of Commons, namely, 64 county and 36 borough members. In the representation of Ireland is one peculiarity, that the majority of voters for the county-members are freeholders of about *forty shillings* a-year.

Ecclesiastical state.—The religion by law established in Ireland is the Lutheran Protestant, or church of England, but the number of Christians of this persuasion bears but a very small proportion to the aggregate of population—perhaps not more than a fifth. It is estimated that three-fourths of the people are Roman catholics, and of the remainder probably one-fifth are presbyterians, or dissenters of some other denomination. The Protestant hierarchy consists of four archbishops and eighteen bishops, arranged as follows: The archbishop of Armagh, primate of all Ireland, has under him seven suffragan bishops, namely, of Meath, Kilmore, Dromore, Down, Connor, and Derry, Raphoe, and Clogher. The archbishop of Dublin, lord-primate of Ireland, has three suffragans,—the bishops of Kildare, Ossory, and Fernes and Leighlin. The archbishop of Cashel has five suffragans,—the bishops of Waterford and Lismore, of Cork and Ross, of Cloyne, of Limerick, Ardfert, and Aghadoe, and of Killaloe and Kilsinora. The archbishop of Tuam has three suffragan bishops,—of Clonfert and Kilmacduagh, of Elphin, and Killala. The inhabitants of Connaught and Munster are chiefly Roman catholics; those of Ulster chiefly Roman catholics and presbyterians; those of Leinster chiefly Lutheran protestants. It is pleasant to record, that though the religious tenets of the Irish are so opposite, it is no uncommon circumstance to see the catholic priest and the parish clergyman uniting in the same Christian and charitable offices.

The Revenues drawn from Ireland are derived from nearly the same sources as in Britain, namely, from assessed taxes, stamp, custom, and excise duties, and the postage of letters; but there is also a tax on hearths. The net produce of the ordinary revenue for the year 1816 was L.6,136,010. Of this produce the customs and excise yielded by far the greater portion, the former having prŏduced L.2,082,043, and the latter L.3,208,931, while the stamp-duties amounted to L.611,709, and the post-office L.222,747. The expenditure of the Irish government for the same year amounted to above L.14,612,560, thus adding to the debt above L.8,000,000. The whole amount of the funded debt of Ireland about the same period was about 130,000,000. Even after the union a distinct treasury bench transacted business in Ireland; but in 1817 the British and Irish treasuries were consolidated.

State of Education.—The education of the lower classes in Ireland has always been deplorably neglected, or has been conducted in such a manner as to produce little improvement in the knowledge and civilization of the people. Even so long ago as the reign of Henry VIII. chartered schools were established for the education of the children of poor Roman catholics, according to the tenets of the church of England, and immense sums have been repeatedly granted by the Irish and imperial parliaments for their support. It is estimated, that, in the course of 70 years, nearly a million of pounds Sterling have been thus expended; and that in 17 years, from the Union to 1817, the grants by the imperial parliament amounted to above half a million; and yet it appears, that with this vast expenditure not more than 20,000 children have, during 70 years, been imperfectly fed, clothed, and educated. The number of these chartered Protestant schools at present amounts to about 33, in which nearly 1000 scholars are maintained.

Of late much has been done, by benevolent societies and individuals, to promote the education of the poor. The Hibernian society holds the first rank among these institutions. By its exertions upwards of 27,000 children, both Protestants and Roman catholics are instructed, on a plan at once liberal in principle and economical in execution. It appears, that not fewer than 4600 schools of various denominations are now actively employed in Ireland in the instruction of 200,000 scholars.

The higher branches of literature are taught in Trinity college, Dublin, (See DUBLIN,) and the Roman catholic college at Maynooth.

Language and literature.—The Irish language is a dialect of the Celtic or Gaelic, and resembles that used in the Highlands of Scotland and the mountainous parts of Wales. Like the Erse and Welsh, it abounds with gutturals, though when spoken or sung it is said to be more melodious. It prevails most in the provinces of Connaught and Munster. The vulgar English dialect, used by nearly one half of the lower orders, differs much from Lowland Scotch, and most of the provincial dialects of England, having many peculiarities of words and phrases. It is very expressive, figurative, and even poetical, but is more regardless of the ordinary rules of grammar than any other variety of our vernacular tongue.

Ireland has produced many individuals illustrious for their talents and eminent for their compositions; as Boyle the philosopher, Swift the satirist and patriot, Denham and Parnel the poets, Sterne the witty sentimentalist, the amiable and all-accomplished Goldsmith, the rhetorician Sheridan, and his namesake the dramatist and orator, the sublime Burke, the eloquent Grattan;—but in her national literature, as exhibited by her national press, she is still behind either of her sister kingdoms. Printers and booksellers are more employed in multiplying copies of English and Scottish works, than in giving to the public original Irish compositions.

Besides the Royal Irish Academy, the Dublin Institution, and some other scientific societies in the metropolis, similar institutions have been recently established in several of the large towns, especially Cork and Belfast. They are particularly noticed under the names of these towns.

The *manners and customs* of the Irish, so far as the lower orders are concerned, display many peculiarities. It is very common for even young men to wear a wig, though by no means destitute of hair; and the wig is often employed as a napkin or *duster.* A loose frieze great-coat fastened at the neck by a single button, or perhaps a pin or wooden skewer, with the sleeves hanging loose and unoccupied, is a very frequent upper garment, even in warm weather. The women generally go bare-headed, and are very fond of thick, coloured petticoats. The cottages or *cabins* are for the most part wretched hovels of one room, constructed with mud or rough stones without mortar, with a clay floor, often without any other opening than the door to admit light and allow the escape of smoke, though they are commonly so ill thatched that the smoke finds its way between the rafters, while the rain descends through the same breaches on the miserable inmates. The furniture of these huts often consists only of a few stools, a chest, and perhaps a truckle-bed, or merely a bundle of straw or heath. In these dark abodes of penury, not only a whole family seek for shelter and repose together on the same floor,—the pig, the cow, the poultry, are also joint tenants with their owners, and are often seen issuing from the door at the same time. Ill as these poor people are lodged, they are scarcely better fed. Potatoes and buttermilk constitute the sole support of many thousands. And yet, with all these privations, as long as health remains, it is surprising how contented and cheerful they appear. If they hear the sound of music, whether vocal or instrumental, they spring to their feet, and dance for a long time with the greatest spirit and agility; and a sup of whisky or a pipe of tobacco is to them a cordial which soothes every care, and banishes every sorrow from the heart.

They are so fond of music that a piper attends on all occasions, whether of festivity or mourning. He precedes the bride and bridegroom at a wedding, and the coffin in a funeral procession. The custom of holding a *wake* on the death of a friend or relation, and employing women to sing the *howl* or funeral dirge over the body, is still prevalent, especially in the Roman catholic provinces. In conveying goods and persons from place to place, the Irish employ a low, flat, simple carriage on two wheels, and drawn by one horse, under the name of a *car*, or *jaunting-car*, on which the goods are laid, while the passengers sit along the sides, with their feet dangling near the ground, or sometimes supported by a narrow foot-board. In no part of the British dominions is posting or travelling in hired carriages so unpleasant. The vehicles are dirty, and crazy for want of repair,—the horses lean, ill-matched, and stumbling,—and the drivers, shabby, rash, and careless, and by no means remarkable for sobriety. A spring is continually giving way, a trace breaking, or a linch-pin coming out; and the driver is always turning aside to take a dram or to worship at some spot of traditional sanctity or superstitious devotion.

The *antiquities* of Ireland are very numerous, and comprehend remains of very different periods and people, from the times of Druidical worship, as it is supposed, to the reign of Henry VIII. In some places are seen cromlechs or circles of stones, similar to those at Stonehenge on Salisbury-plain, which are usually regarded as Druidical places of worship; in others *cairns* and *barrows*, or stony and earthen hillocks of very early antiquity, raised over the bodies of the illustrious dead, probably such as fell in battle. Round towers of a peculiar structure, supposed of Danish origin, are very common. They are generally about eighty feet high, constructed of square stones, and have a door-way about fifteen feet from the foundation, but without steps or any other apparent means of ascending to the opening. Near the top are several holes for admitting light. Their use is not known, but as they are commonly situated in the neighbourhood of a church, they are supposed to have been employed as places of worship or penance. Stone-crosses are occasionally seen on rising grounds, and are held in much reverence by the Roman catholic peasantry. Many ruins of cathedrals, churches, and monasteries occur, some of Saxon, others of Gothic architecture. Among them may be particularly noticed the chapel of Cashel, the cathedral and Franciscan abbey of Ardfert, the castle and abbey of Adair, and the ancient castle of the noble house of Antrim.

History.—Few nations have arrogated to themselves a higher antiquity than the Irish, whose fabulous history has by some writers been carried back so high as the 20th century after the creation. But nothing certain or satisfactory can be brought forward respecting the events of Irish history, or the state of the country, previous to the arrival of the Roman general Agricola in Britain. It appears indeed that, long before that period, Ireland was inhabited by a Celtic race who had probably passed over from Scotland, since not only the language and manners of the Irish and Scotch resembled each other, but the former were long known by the name of Scots. The dispute between the two nations, which had the honour of colonizing the territory of the other, is nugatory, as there is sufficient historical evidence to shew that a mutual interchange of inhabitants has repeatedly taken place, especially between the north-east of Ireland, and the south-west of Scotland.

Seventh century.—One of the earliest events of any interest recorded in the Irish annals, is the introduction of Christianity into that island. At what period, and by whom that reformation was commenced, is uncertain, though it must have been some time between the fourth and sixth centuries; for in the seventh century Christianity was established over great part of the island. It was then celebrated for its monastic and academical institutions, had become the resort of pious and learned men from most countries of Europe, and formed the chief centre from which the knowledge of the gospel flowed to distant and more uncivilized regions. That St Patrick, the tutelary saint of Ireland, had some considerable share in the propagation of the new religion can scarcely be doubted, though the history of that apostolic worthy is founded on tradition and involved in fable.

While the people were thus receiving the light of Christianity, the country was repeatedly torn by internal dissensions between the numerous rival chieftains among whom it was divided, and harassed by invasions from external enemies. As often as any of the native princes acquired the ascendancy, he assumed the title of king of that particular district in which he had been successful; but the higher denomination of King of Ireland seems not to have been arrogated till a later period. During the 7th century, Ireland was invaded by the Saxon Northumbrians, and who carried devastation wherever they went, burning churches and monasteries, and plundering the inhabitants of the districts on which they landed.

Tenth century.—A more formidable invasion took place about the beginning of the tenth century. A band of those northern adventurers called indiscriminately Danes, Norwegians, and Oestmen, who had already effected a successful landing in England, disembarked on the eastern coast, under a daring leader named Tergesias, and advancing towards Meath, speedily established a colony. Though their leader was defeated and slain in a contest with the prince of Meath, the Danes maintained their position, and receiving frequent accessions to their numbers from the north, not only became formidable enemies to the Irish princes, but occasionally crossed the Channel in predatory expeditions on the coast of Wales. Their chief stations were Dublin, Limerick, and Waterford.

Twelfth century.—In consequence of the repeated attacks made by the Irish pirates on his Welsh territories, Henry II. king of England resolved to take signal vengeance on these presumptuous islanders, and even attempt the subjugation of their country. With this view he procured from the pope a bull empowering him to take possession of Ireland as a grant from the holy see; and in 1155 he convened a council at Winchester to decide on the measure, and contrive the means of carrying it into execution. But for some years his own affairs, and especially his disputes with the king of France, prevented Henry from sending an expedition against Ireland; and indeed he seems to have waited till some internal commotion in that country should afford him a pretext for interfering in its concerns, and assuming an air of authority over its native princes. Such an opportunity occurred in 1162. Roderic O'Connor, titular king of Ireland, and Dermot, prince of Leinster, entered into a dispute in consequence of the latter having treated with indignity the wife of one of Roderic's vassals. Roderic invaded the territory of Leinster, and, aided by the subjects of Dermod, who had rendered himself obnoxious by his tyranny and oppression, took possession of the principality, and compelled Dermod to take refuge in England. There he contrived to ingratiate himself with Henry, and soon persuaded that monarch to espouse his cause, and assist him with an armed force in the recovery of his dominions. Henry issued a proclamation, permitting any of his subjects to enrol themselves under the standard of Dermod, and promising to confirm such grants of money and lands as they should receive from the Irish prince as a remuneration for these services. Two young noblemen, remarkable for their courage and intrepidity, Robert Fitz-Stephen, and Richard Strigul, better known by the name of Earl Strongbow, engaged to lead two bodies of troops to combat with O'Connor and his allies. Fitz-Stephen first crossed the channel with 60 men in complete armour, and about 300 archers and spearmen, in 1170, and landing in the neighbourhood of Wexford, advanced in concert with Dermod to the attack of that city; and, after an ineffectual resistance on the part of the inhabitants, compelled it to surrender at discretion. This formidable alliance of his rival with the English induced Roderic to conclude a treaty, by which the tyrant Dermod was allowed to recover the province of Leinster, on acknowledging the superiority of Roderic as king of all Ireland.

As Dermod found it difficult to bring back his subjects to their allegiance, Earl Strongbow, in the following year, joined him with a strong reinforcement. By their united efforts, the province was brought under entire subjection. Strongbow became the son-in-law of Dermod, and, on his death in 1171, succeeded to the principality of Leinster. But it proved no easy enterprise to maintain the footing he had thus gained in Ireland, against the native princes on the one hand, and the restless Danes on the other,—and Richard was compelled to solicit more effectual military aid from king Henry. In consideration of being put in possession of Dublin, and some other towns on the coast, the English monarch, in 1172, made his long projected visit to Ireland, attended by 500 knights and about 4000 soldiers; and such was the dismay occasioned by this formidable armament, that the Irish princes quietly submitted, and even O'Connor was at length induced to acknowledge Henry as his liege lord, and agree with the other chieftains to pay him an annual tribute. In 1177, by virtue of a bull from pope Adrian, Henry assumed the title of Lord of Ireland, which humble title was retained by his successors for above two centuries. Still the authority of England over Ireland was little more than nominal. The native chiefs viewed with a jealous eye every attempt of Henry's deputies to extend the limits of their original acquisitions, and eagerly seized every advantage which their weakness or dissensions placed within their reach; and, during the reign of Henry, little progress was made in the absolute subjugation of the country.

Thirteenth century.—John had for eleven years swayed the English sceptre before he effectually established his dominion in Ireland. But in the beginning of the thirteenth century, through the vigorous operations of his general, Fitzhenry, he brought under his subjection most of Leinster, Ulster, and Munster, and even part of Connaught, the hereditary dominion of the O'Connors. The English territories were then divided into 12 or 15 counties; a code of laws on the English model was formed, and courts of justice were instituted at Dublin. To carry these judicious plans into execution, John, in 1218, visited his Irish dominions, and six years after, having been compelled by his English barons to sign *Magna Charta*, he extended the benefits of that bulwark of freedom to the sister country.

During the long reigns of Henry III. and Edward I., nothing of importance occurs in the history of Ireland, except that in 1295 the first regular parliament was held; but as that assembly was composed almost entirely of English deputies, its acts served only to keep alive the animosity of the native inhabitants. Indignant at the tone of superiority assumed by their English masters, and glowing with vengeance for the wrongs they suffered, they resolved to embrace the first opportunity to break their servile yoke, and emancipate themselves from their degrading thraldom. But so disunited were the chiefs, that, without the aid of some friendly power, no attempt at general rebellion was likely to succeed, and they were obliged for some time to rest contented with acts of retaliation and petty warfare.

Fourteenth century.—At length, the defeat of Edward II. by Robert Bruce, in the decisive battle of Bannockburn, raised the character of the Scotch so high in the estimation of their neighbours, that the Irish were induced to solicit the assistance of the victorious Bruce in the recovery of their liberties, or rather in effecting a change of masters, for they offered to confer the dignity of king of Ireland on the Scottish monarch's younger brother Edward. Though not very sanguine as to the success of the expedition, Robert saw that it would be attended with two advantages to himself, by distracting the attention of his English neighbours, and gratifying the ambition of a brother who had been signally serviceable in his late contests. He therefore acceded to the wishes of his new allies, and assembled an army of about 6000 men, with which Edward Bruce landed at Carrickfergus, in Ulster, in 1315. For some time the allied Scotch and Irish forces carried all before them,—ravaged the province of Ulster, advanced into Leinster, and laid siege to Dublin. But here their good fortune forsook them, and they found themselves opposed in their further progress by an army of nearly 30,000 men, under the command of Roger Mortimer, a new governor, who had been lately sent over by the English court. Although the Scottish army had been reinforced by Robert Bruce in person, it was unable to resist such superior numbers, and retreated into Ulster; but that province had been so much exhausted by their former imprudent devastation, that it no longer supplied the necessary resources. Edward led his little band, now much reduced by famine and disease, towards the coast, in the hope of finding an opportunity of reimbarking for Scotland; but he was intercepted near Dundalk by a body of troops, commanded by Sir John de Birmingham; and, after an obstinate conflict, the Scots were entirely routed, and Edward Bruce himself left among the slain. This battle, which took place in 1318, decided the fate of Ireland, and left it still under the dominion of England.

Edward III. for some time pursued the same impolitic and oppressive measures which had rendered the English yoke so galling. In order to replenish his coffers, exhausted by his long though successful wars with France, he resumed the grants of land made by his predecessors in favour of Irish proprietors, and ordained that none but Englishmen born should be capable of holding estates in Ireland; but from this tyrannical resumption he was in a great measure diverted by the representations of the Irish parliament, which, about this time, had been rendered respectable by the exertions of Sir Thomas Rokeby. This amiable man was appointed governor of Ireland in 1356, and, by his wise and lenient administration, endeavoured to remove the impressions made on the Irish by the tyranny of former governors; and had he not been counteracted by the prejudices of his sovereign, he would, in all probability, have not only much improved the state of the country, but would have lessened the animosities which had always subsisted between its inhabitants and the English settlers. Prince Lionel, second son of Edward, had married the heiress of Ulster, and, in right of his wife, had taken the title of Earl of Ulster, still enjoyed by the second son of the British monarchs, and it was supposed that sending him over, with a sufficient force to establish his claims, would both strengthen the English interest in Ireland, and ingratiate the sovereign with his Irish subjects. Lionel was therefore appointed chief governor; but his administration was partial and arbitrary, and rather tended to make the English character more obnoxious. In 1367, the Irish parliament past the famous statute of Kilkenny,—a most impolitic act, which, by separating as far as possible the interests of the English settlers from those of the native Irish, still farther widened a breach already too large. By this act, the Irish name, language, dress, and customs, were decried as infamous, and no connexion could take place between an English and an Irish family, without subjecting the former to forfeiture and disgrace. Not only the impolicy, but the impracticability of such an oppressive measure soon became apparent; and it does not appear that the penalties threatened by the act were often carried into effect.

During the weak reign of Richard II., the English affairs in Ireland underwent little alteration. That prince twice visited Ireland during the short period that elapsed between his assuming the reins of government and his deposition by his cousin Bolingbroke. In the first of these expeditions he was pretty successful, and received the homage of the Irish princes; but in the second, in 1399, his army, though considerable, was so much harassed among the bogs and forests that he was compelled to make a precipitate retreat.

In the *fifteenth century*, the English monarchs, from Henry IV. to Henry VII. inclusive, were so entirely occupied in their attempts to subjugate France, or in struggles to preserve their authority at home, that they had little leisure to bestow on their Irish subjects, who were thus left to foster their mutual animosities, and involve the country in confusion and ignorance. The contentions among the native chiefs rather increased than diminished; and fortunate was it for the English families that such a disunion subsisted, for as the latter were also divided into factions, had the native princes been united among themselves, the English residents might have soon been extirpated or expelled. Two noble families, the Geraldines of Kildare and Desmond, and the Butlers of Ormond, headed the principal parties among the English, and were alternately in favour or disgrace with the reigning monarch. Nothing of importance took place till the reign of Henry VII., when Lambert Simnel, who pretended to be the earl of Warwick, nephew of Edward IV., past over into Ireland in 1486, and was there proclaimed king, under the title of Edward VI. The impostor was openly favoured by the Earl of Kildare, then lord-deputy, and by the Irish council, who had always shown themselves strenuous adherents of the house of York. The reign of the usurper was very short. His imposture was detected, and though he was aided by a body of 2000 Germans, sent over by the duchess of Burgundy, he and his little party were obliged to return to England, where in 1487 the fate of Simnel was decided by the battle of Stoke. In 1494 Sir Edward Poyning was nominated lord-deputy, and received full powers to quell the rebellious spirit of the Irish, and repress the inordinate power of the nobles. Soon after, the earl of Kildare, who, though he had on various occasions shown himself an enemy to Henry, possessed great power and influence in the country, was appointed lord-deputy in the room of Poyning, and appeared resolved to make amends for his former defection, by employing all those means which he so eminently possessed, of ingratiating himself with the leading nobles, in the service of his master.

Sixteenth century.—Among other plans for effecting his purposes, Kildare connected himself by marriage with the noble house of Clanricard, which also possessed great influence in Ireland; but this measure, in appearance so well adapted to cement together rival interests, proved unfortunate to both parties, and gave rise to a civil war. Kildare and Clanricard, both men of strong passions and great ambition, differed on some trivial point, and their new alliance was converted into the most implacable enmity. The principal English nobles and Irish chieftains arranged themselves under one or other of these rival lords, and it was determined to decide their differences in the field. A meeting took place between the hostile armies in 1504 at Knocktow, near Galway, and though Clanricard's forces exceeded those of Kildare in numbers, they were compelled to yield to the superior skill and discipline of the latter.

Clanricard and his allies were routed with great slaughter, and the power of the lord-deputy remained pre-eminent.

Henry VIII. continued Lord Kildare in the government of Ireland, till the death of that nobleman in 1513; and though the influence of the Geraldines was repeatedly supplanted by that of the Butlers, the king several times conferred the same dignity on his son Gerald. About the year 1520, the court of France began to practise those intrigues which it ever after exercised, to diminish the power of the English monarchs by fomenting disturbances in Ireland. With this view, French emissaries were employed to detach Kildare from his allegiance; and they succeeded so well, that in 1534, the earl, who then enjoyed the post of deputy for the third time, flew into open rebellion, and, leaving his son to execute the duties of governor, took the field at the head of a considerable force. For some time he was more successful than could have been expected; but in 1535 he was overpowered, and died as is supposed of a broken heart. His son and five brothers perished by the hands of the executioner, though the king on their surrendering themselves had given them reason to expect a free pardon. After several more acts of rebellion on the part of the Irish chieftains, tranquillity was completely restored; and in 1541 the title of Lord of Ireland was exchanged in the person of Henry for that of King. On this occasion Henry endeavoured to attach to his interest some of the leading members of the late rebellion, by raising the Irish chiefs O'Neil and O'Brian to the rank of earls, the former of Tyrone, the latter of Thomond, and creating De Burgh earl of Clanricard.

As yet religion had been little concerned in the disturbances which continually took place in Ireland; but when Henry had abjured the supremacy of the pope, and had assumed the title of head of the church, he laboured to reduce his Irish subjects to the same religious subjection under which he had brought the greater part of the people of England. The same policy, with the more direct and rational view of introducing the Protestant faith, was pursued by his successor Edward VI. but very little success attended the efforts of either monarch. So great was the influence of the Irish Roman Catholic clergy, and so deplorable was the ignorance which prevailed among the great body of the people, that comparatively few proselytes were gained over to the reformed principles; and the attempt to impose on the nation a religion which it held in abhorrence, served only to add new fuel to the fire of rebellion, and to introduce a new cause of national animosity. Though the accession of Mary conciliated the people of Ireland in matters of religion, it could not subdue the spirit of political disaffection, which was kept alive by the intrigues of O'Brian and O'Neil.

The same spirit continued to display itself in the greater part of the reign of Elizabeth. O'Neil had been taken into favour by that princess, through the interposition of the earl of Kildare; but his restless and turbulent mind soon hurried him to fresh acts of rebellion, till he was at length assassinated by a party of Scotch troops to whom he had surrendered. The mutual dissensions of the Desmond and Ormond families, too, still continued to embroil the country, till the head of the former, after being imprisoned, and contriving to make his escape, fell a victim to his own imprudence. For some time Elizabeth contemplated these proceedings with apparent indifference; but at last, in 1584, she, with her usual prudence, adopted the only measure likely to conciliate and tranquillize the Irish nation,—the appointing of a governor of abilities, who possessed the confidence of the people whom he was to rule. Sir John Perrot was a favourite among the Irish, and during his administration the chieftains remained tolerably quiet, and the people enjoyed a greater equality of freedom and justice than at any former period since Ireland came under the dominion of an English monarch. But so impolitic were the advisers of the queen, and so jealous were the English of any favour or privileges conferred on the Irish, that in a few years Perrot was recalled, and superseded by Fitzwilliam. His partial conduct and haughty demeanor again excited the flame of disaffection, which had been smothered but not extinguished. Seizing the opportunity of the war between Elizabeth and Philip of Spain, and in eager expectation that the formidable invasion long threatened by the latter would prove successful, the Irish chiefs assembled their followers, applied to Spain for assistance, and, in 1595, raised the standard of rebellion. Hugh O'Neil headed the principal body in Ulster, and O'Donnel, with another band, made a diversion on the side of Munster. They were opposed successively by Lord De Burgh, Lord Montjoy, the Earl of Essex, and Sir George Carew, and the issue of the contest remained doubtful for some years.

Seventeenth century.—In 1601, the rebels received a reinforcement of 6000, and afterwards of 2000 Spanish troops, and, with their assistance, contrived to prolong the civil war till 1603, when, after a bloody battle, O'Neil and his confederates capitulated; and thus the year which terminated the long and glorious reign of Elizabeth, put a period to the most formidable rebellion that had ever been raised in opposition to the power of England.

Thus James I., on his accession to the English crown, could boast more than any of his predecessors, that he held the undisputed sovereignty of the Bristish islands. The reign of this monarch was favourable to Ireland. Abandoning, in a great measure, the narrow policy by which the affairs of that country had hitherto been directed, James acquiesced in those measures which were now adopted for improving the condition and alleviating the burdens of an oppressed and insulted people. The invidious distinctions that had formerly been encouraged between the pure English families and those which were only connected with such families by marriage, were in a great degree abolished; the administration of justice was facilitated by the establishment of regular circuits; the arbitrary power exercised by the nobles and great proprietors over their dependents and tenants was restricted; and the education of youth was promoted by the institution of schools and additional grants and privileges to the university of Dublin. The estates which were forfeited in consequence of the late rebellion, amounting to above

800,000 acres, were judiciously parcelled out among new settlers. These measures, begun by Lord Mountjoy, and carried on by his successors in the viceroyship, received the sanction of the national parliament assembled in 1613.

The *troubles*, as they have been emphatically called, which distinguished the unhappy reign of Charles I., could not fail of extending to Ireland; and during the contest between the king and the parliament, that country was one continued scene of civil discord. At the commencement of his reign, Charles had sent over Lord Wentworth as lord-lieutenant; and though the administration of that nobleman had been mild and equitable, the Irish parliament, as soon as they found the king engaged in a war with his Scottish subjects, and embroiled with the English House of Commons, presented a list of grievances which they affected to have suffered under Wentworth. No sooner were these redressed by the complying monarch than, as in England, the remonstrants rose in their demands; and as if religious differences were forgotten in this struggle for independence, the Popish recusants for some time united with the Puritans in a formidable and ultimately a successful opposition to the royal measures. In the mean time, Roger Moore, descended from an illustrious but decayed family in Queen's county, assumed the command of a body of armed malcontents, and attempted to seize the castle of Dublin, and though he failed in this enterprise, he soon after defeated a party of the royalists at Drogheda. Emboldened by this success, they ventured to attack a strong detachment of the king's forces under the Earl of Ormond, but they met with so warm a reception that they were compelled to retreat in disorder. But, in 1642, this rebellion wore an aspect so appalling, that the English parliament procured from their new allies, the Scots, an army of above 20,000 men under the Earl of Leven, who soon after returned home without affording any effectual aid. The insurgents now assembled a convention, who appointed a committee of twenty-four, under the title of the Supreme Council of the confederated Catholics of Ireland. This confederation continued to form a strong party during the civil war. They alternately sided with the Puritans and negotiated with the king, and in proportion as Charles's affairs became more desperate, his concessions in favour of the Roman catholics increased, in the hope of receiving from them effectual aid in men and money for carrying on a hopeless contest with his British subjects. He had delegated his authority in Ireland to the Earls of Ormond and Glamorgan; but as these noblemen acted without concert, they rather injured than promoted the cause of their royal master, and the unfortunate monarch, just when he was enjoying his last glimmering of hope from that quarter, in consequence of the treaty between his deputies and the Irish confederation in 1648, was himself led to the scaffold.

After the death of Charles, Ormond, supported by the Catholic confederation, still continued to act as lord-lieutenant in name of the exiled king, and vainly attempted to support the royal cause against the superior skill and genius of Cromwell. The Protector visited Ireland in 1649, and employing well-disciplined troops, under Ireton and other able generals, gradually succeeded in reducing the principal towns and fortresses, and, before his death, saw his authority as generally acknowledged, and his government at least as popular in that country as in England.

Before the restoration of Charles II. to the throne of England, his friends in Ireland, including most of the Catholics, had made some progress in establishing his authority. Ormond, who had been compelled to take refuge abroad, now returned to his native country, was again appointed lord-lieutenant, and was rewarded for his long and faithful services by a grant of L.30,000, and the elevation of his son to the peerage. The prosecution of rebels, the confiscation and new settlement of estates, the regulation of the courts of justice, and the establishment of the Protestant hierarchy, occupied the chief attention of the king and the Irish parliament till 1665, when, after much debating in the House of Commons, and some management on the part of the viceroy, the act of settlement securing the crown of Ireland to Charles and his descendants was passed into a law. No lord-lieutenant had been more deservedly popular than Ormond. He had, at different times, enjoyed that high office for nearly forty years; his administration had been firm but gentle, and he had exerted himself to alleviate the distresses of his countrymen, and to excite among them the spirit of industry, by encouraging the staple manufacture of the island. But in the latter end of that reign the junto denominated the *Cabal*, which had acquired such an ascendancy over the weak mind and debilitated faculties of the luxurious Charles, conceived a prejudice against the high-minded champion of the Stuart interest in Ireland, and easily effected his downfal and disgrace.

The short reign of James II. was distinguished for nothing in Ireland but the open and tyrannical measures pursued by the king and his lord-lieutenant, the Earl of Tyrconnel, to overthrow the Protestant religion and introduce Catholics, as far as possible, into all places of trust and emolument. But the Protestant nobility and gentry, though far inferior in numbers to those of the Catholic persuasion, and dispirited by the oppression they now experienced, still formed a strong party in the state, and possessed the ascendancy in parliament. Alarmed by a rumour that a general massacre of this party was projected by the Papists, the Protestants of the south and the interior flocked to the coasts, intending to quit the country; but their brethren in Ulster, being more numerous, resolved on a vigorous resistance, and, assured of speedy aid from William III. who had just been placed upon the British throne, they in 1688 prepared for an obstinate defence.

James, though deposed in Britain, was still regarded as king by the majority of his Irish subjects; and in March 1689 he landed at Dublin to support his claims in person. He endeavoured to ingratiate himself with the Protestants, by professions of regard and promises of protection; but as he openly courted the favour of the Catholics, and was every where received by them with the strongest marks of devotion and confidence, his professions were justly deemed insincere, and his promises delusive. The chief strength of the adherents of William was concentered at Londonderry, and thither James directed his first movements.

The city was garrisoned by about 7000 soldiers, but Lundy the governor, though he pretended to hold the place in the name of William, was, in reality, devoted to the interests of James. The town was by no means in a condition to sustain a regular attack from a well disciplined army. It was without cannon; the fortifications, originally imperfect, were out of repair; and the stores and provisions were so scanty, that any long resistance, by a place containing, besides the garrison, a population of 30,000 inhabitants, was scarcely to be expected. And yet, with all these disadvantages, and besieged by an army of 20,000 men, headed by the king, whose name is, in general, itself a host, the citizens of Londonderry determined to hold out to the last extremity. Suspecting the treacherous designs of Lundy, who declined defending the place against such an unequal force, they appointed George Walker, a patriotic protestant clergyman, and Major Baker, joint governors of the city. Few more memorable sieges are recorded in the British or Irish annals. At first, James, occasionally battering the walls with his artillery, attempted several times to carry the town by assault, and, as the besieged kept their gates open, these attempts appeared certain of proving successful;—but such was the vigilance and intrepidity of the soldiers and the citizens, that the assailants were always compelled to retreat with loss. On one occasion the apprentice-boys assembled in an inconsiderable number, and just as the besiegers had advanced within 300 yards of one of the gates, drew up the draw-bridge, locked the gate, and saluted the enemy with huzzas of derision and defiance. Not contented with repulsing the direct assaults of James' troops, the besieged frequently sallied from their gates, and attacked the advanced guards of the enemy, destroying their works, and driving them back with terror and consternation to the main body. Finding all his attempts to storm the town ineffectual, James resolved to convert the siege into a blockade, and to repair to Dublin, leaving his army under the command of Rosen, a skilful and experienced German officer. The city remained exposed to all the horrors of war and famine for above four months, and about 3000 of the garrison and many of the citizens had perished, when, at the end of July, just as all hopes of preserving the place had vanished, it was relieved from the most terrible of its calamities, by the arrival in Loch Foyle of some vessels laden with stores and provisions. Indignant at his repeated failures, and impatient of the delay occasioned by this unsuccessful siege, James withdrew his forces from Londonderry, to employ them in more active service.

In the mean time, James had summoned a parliament, composed chiefly of Catholics, and this assembly had repealed the act of settlement, and passed acts of attainder against the principal leaders of the Protestants. James, while he remained triumphant, displayed the same bigotry and impolicy that had estranged from him the hearts of the English, and authorised, or at least permitted, the cruelty and oppression which the Irish Catholics exercised on their Protestant countrymen. But the hour of retribution was at hand. The army of William, commanded by the veteran Duke of Schomberg and Count Solmes, disembarked at Bangor, and, after reducing Belfast, Carrickfergus, and some other towns, marched towards Dundalk. There they took up a bad position, and acted only on the defensive till William himself landed at Carrickfergus in the middle of June 1690. Impatient of the inglorious inactivity and dilatory measures of his generals, William immediately put himself at the head of his troops, now amounting to 36,000 men, chiefly foreigners, and advanced towards the south. James, on hearing of his rival's motions, had left the capital and joined his army at Dundalk; but though his troops were little inferior in number to their opponents, and were composed of Irish and French soldiers, he thought it prudent to retire on William's approach. He accordingly retreated towards Drogheda, near which he passed the river Boyne, and determined to try the fate of a battle.

William, closely following his retreating foe, arrived at the northern bank of the Boyne on the last day of June; and, after reconnoitring the position of the enemy, resolved, contrary to the advice of Schomberg, to attack them on the following morning. The troops of James were strongly posted, and had between them and the river a morass and a rising ground. William divided his army into three bodies; one of which he entrusted to the command of Schomberg, while he himself headed another, consisting chiefly of cavalry. The battle commenced about six o'clock on the morning of the 1st of July, with a successful attack of William's right wing on the left of the Irish; but an attempt to follow up this success by the passage of the centre proved unfortunate. This division was formed chiefly of French Huguenots, who were soon thrown into disorder. The duke of Schomberg flew to rally them, and, exclaiming, "*A la gloire, mes enfans!*" threw himself into the water, and crossed the river at their head, but at that moment he was taken prisoner by a party of the enemy, and soon after was accidentally shot by some of his own soldiers. William then advanced with his cavalry, intending to take the other army in flank, and turn their right wing; but in this he failed, and would probably have been defeated, but for the bravery of some Enniskillen Protestants, who formed part of his division, and, rushing on the French infantry, soon bore down all opposition, and turned the fortune of the day. James, who had viewed the action from a hill near the field of battle, seeing all was lost, mounted a fleet horse, and, escorted by a body of cavalry, galloped off to Dublin; and so great were his fears for his personal safety, that, after staying only a very short time in the capital, he pursued his flight to Waterford, and there embarked for France, leaving his adherents to fight their own battles, or make the best terms they could with the victor.

In the first place, they chose the former alternative; for the army of James, though defeated, was not dispersed. It had lost in the battle of Boyne 1500 men, while the loss of William did not exceed 500; but still more than 48,000 soldiers were left. Some of them concentered themselves in Athlone, while others repaired to Limerick, and there prepared to make a vigorous stand. King William, after issuing a proclamation, promising a free pardon to all but the principal leaders of the rebellion, and receiving the submission of Drogheda and Dublin, detached part of his army, consisting of 10 regiments of infantry and five of cavalry, against the adherents of James in Athlone, while he himself with the remainder proceeded to the attack of Limerick. The detachment sent against Athlone proved too weak to effect any thing of consequence, and retired to join the main body before Limerick. This town was strongly garrisoned and commanded by M. Boileau, a French officer of considerable skill and experience; and the inhabitants being chiefly Catholics, and strongly attached to the cause of James, refused to capitulate, and offered so vigorous a resistance even during a three hours assault, that William, having lost 300 men in killed and wounded, was compelled to retreat. Finding that the war was likely to be protracted longer than he had expected, he quitted Ireland to attend to his concerns in Britain, leaving the command of his troops to count Solmes and Ginckle, the ancestor of the present house of Athlone, and intrusting the executive government to two of the lords justices.

After William's departure, Ginckle of Athlone obtained some advantages over the Jacobites of that district, and though they had been reinforced by some troops from France, under the gallant Saint Ruth, he carried Athlone by storm in June 1691, and soon after defeated the combined French and Irish forces with great slaughter at the battle of Aghrim, in which Saint Ruth was slain. He then proceeded to Limerick, and by blockading the town obtained possession of it, just when it was on the point of being relieved by a French reinforcement. The articles of capitulation by which this last place of importance submitted to William were well calculated to soothe the irritated feelings of the nation, and reconcile the people to their new monarch; but about 14000 of James's adherents left Ireland, and entered into the service of France and other foreign powers. Two successive Irish parliaments were summoned by William in 1692 and 1695. The first acted with independent spirit, as the champion of their country's rights and liberties; but the other yielded a ready compliance with most of the impolitic measures which national jealousy and prejudices induced the British government to propose, by sanctioning those restrictions on the manufactures and commerce of Ireland, and those statutes against her religious liberties, which disgraced the greater part of that reign. The independence of the Irish parliament, which had for some time languished, soon rapidly declined, but it had not as yet received its death-blow.

Eighteenth Century.—The accession of Queen Anne to the thrones of Great Britain and Ireland in 1701, produced no important change in the government or condition of the latter kingdom. The same restrictions on trade and commerce continued, and the penal statutes against the Roman catholics, far from being removed, were increased in severity. But, though galled and irritated by the supercilious neglect or haughty superiority with which they were treated by the English, the spirit of the people was too much humbled, and the sufferings they had endured in the late civil commotions were too fresh in their remembrance, to induce them to make any attempt towards throwing off their allegiance; and they remained quiet during the life of Anne and that of her immediate successor.

The reign of George I. may be said to have completed the subjugation of Ireland, by rendering its parliament entirely dependent on that of Britain, thus removing the last barrier of its national independence. In 1720, in consequence of the Irish house of peers asserting their right of final decision in all cases brought before them, without appeal to the British Parliament, an act was brought into the latter "for the better securing the dependency of Ireland on the crown of Great Britain," in which, after declaring the competency of the British Parliament to make laws and enact statutes binding the people of Ireland, the right of final appeal in Irish cases was expressly challenged by the British House of Peers. This act met with considerable opposition from several eminent members, especially the duke of Leeds, Mr Pitt, and Mr Hungerford, but it passed both houses, and received the royal assent:—four years after appeared the celebrated Draper's Letters of Dean Swift, on occasion of the attempt to introduce into Ireland what was considered a base copper coinage. Whatever may be the opinion of different parties and persons of these letters and the measure that called them forth, they produced such a sensation both in Ireland and England, that Wood the patentee gave up his claim, and the obnoxious coinage was recalled. In 1727 the privileges of the Irish catholics were still farther infringed by their being declared incapable of voting in the election of members of parliament.

Nothing worth recording occurred in Ireland in the early part of the reign of George II. except that in the year 1731, when the duke of Dorset was appointed lord-lieutenant, a grand trial of strength took place between the parties into which the nobility and gentry were at that time divided. One of these parties warmly advocated the cause of Irish freedom, partly from principle and partly from opposition to the ruling powers, and were therefore called the patriots. The other party were attached to administration, and voted for every measure that could contribute to advance the British interests, whether friendly or hostile to the prosperity of Ireland. At the period now mentioned, these parties were so nearly balanced, that a debate in the House of Commons, on a motion for granting a large sum towards paying the national debt, brought forward by those in the British interests, was negatived by a majority of *one*. In 1745, when it was a matter of some consequence to keep the Irish quiet during the rebellion in Britain, the earl of Chesterfield was appointed lord-lieutenant; but though his administration was extremely popular in Ireland, and appeared likely to prove beneficial to both countries, he was recalled as soon as the fear of disturbances had subsided. For some years after the rebellion in favour of the Stuarts, the contentions between the rival parties in Ireland, and the struggles of the *patriots* to oppose the measures of their opponents, or to forward their own interests, continued with various success. In 1756, when the country suffered considerably under commercial difficulties and a scarcity of grain, some alarming riots occurred in Dublin, in consequence of a rumour that a union with Britain on terms very unfavourable to Ireland was in contemplation; but they were soon quelled, without having proceeded to any serious length. During the war with France and Spain between 1755 and 1763, the Irish in general not only remained quiet, but shewed their loyal attachment to the house of Hanover, by coming forward with alacrity to repel a partial invasion of their country by the French in 1759. A formidable invasion had long been threatened, and it is probable that the trifling descent of Thurot with 600 men on the coast of Antrim was intended as an experiment to ascertain how far such an invasion would prove successful. But Thurot was quickly compelled to abandon his enterprize, and no similar attempt was made during that war.

At the commencement of the reign of George III. the condition of the lower orders in Ireland was pitiable and alarming. The depressed state of trade and manufactures, and the extension of grazing farms in preference to tillage, had thrown out of employment some thousands of labourers and mechanics; and the inclosing of large commons, on which the poor had been accustomed to feed their cows or sheep free of expence, deprived many of the peasantry almost of the means of subsistence. Rendered desperate by their misfortunes and privations, these unhappy men assembled in large bodies, under the denomination of *White Boys* and *Hearts of Oak*,—the former distinguished by wearing a white frock over their ordinary dress, and the latter by bearing oaken leaves in their hats. They soon spread terror and devastation over the country, burning stacks and farm-houses, breaking into private dwellings and carrying off arms, destroying machinery, pulling down fences, and not unfrequently proceeding to the most brutal acts of violence and murder. So alarming had these outrages become in 1763 and 1764, that an armed force was found necessary to prevent them; and several of these misguided wretches were tried, condemned, and executed. Previous to the period under consideration, the Irish parliament had been assembled, and continued during the pleasure of the sovereign, and was seldom changed during his reign; but in 1768, a bill was proposed by the patriotic party in the Irish House of Commons, to restrict the duration of parliament to seven years, thus placing it on the same footing with that of Great Britain. The British government, desirous, as it is supposed, of preventing such a limitation, returned the bill with the trifling alteration of adding another year to the proposed term; and the bill for octennial Irish parliaments was passed and continued a law till the union of the two countries. During the government of Lord Townsend some disturbances took place in Ulster, where the practice of granting leases on the payment of a sum in hand, under the name of a fine, had become general, and proved so oppressive to the small farmers, that many of them quitted the country and emigrated to America, while others raised an insurrection, which was not quelled without a military force.

At the beginning of the American war, the British ministry seemed at length to have become sensible, that the true method of conciliating the people of Ireland, and preventing their breaking out into acts of insurrection and rebellion whenever Great Britain was engaged in a contest with a foreign power, was to remove the restrictions and invidious distinctions which had estranged so large a part of the population. They, therefore, consented to allow rather more privileges to the mercantile and trading part of the nation, and to repeal or amend some of the statutes against the Catholics, especially those which authorised a son or heir at law to take possession of the family estates on his embracing the Protestant religion, and which restricted Catholics from making purchases of landed property. But these concessions were too scanty to prove satisfactory, and the necessary removal of the troops of the line from Ireland to supply the increasing demand for men to prosecute the war, by leaving the island nearly unprotected against invasion and internal tumult, led to a measure which enabled the Irish to assert their rights and privileges under circumstances which could scarcely fail of commanding success, while, at the same time, it was authorised by law. This measure was the establishing of armed associations or volunteer corps, for the legal and constitutional defence of the country.

It began at Belfast in 1779, and gradually extended over all Ireland, so that, in the course of two years, the volunteer corps amounted to 50,000 men. To such a legalized armed force what was impossible? Had it essayed to emancipate the country entirely from the British yoke, the enterprise would have been comparatively easy, considering the impracticability of sending a sufficient body to oppose the attempt. But fortunately for both countries, the actions of the volunteers, though firm, were temperate; and their first proceedings were deemed so useful that, except one dissenting voice in the House of Peers, they received the unanimous thanks of the Irish parliament. Indeed, that assembly, thus supported, assumed a degree of boldness unequalled at any former period. They sent an address to the throne, declaring their conviction that the ruin of Ireland could be prevented only by allowing a free trade, and not by temporary expedients. They voted the usual supplies for six months; and they passed a resolution that the imposition of any new taxes was at present inexpedient. Thus compelled to adopt measures of conciliation, Lord North, then at the head of administration in Britain, agreed to a greater equalization of commercial privileges; but as this concession was regarded as still but a "temporary expedient," liable to be recalled when a favourable opportunity presented, public meetings of the volunteers and inhabitants of the principal towns were held, and resolutions, strong but temperate, were passed, declarative of the national sentiments in favour of Irish independence, a free trade, and a free parliament. One of these assemblies, which met at Dublin on the 9th June 1780, and at which the duke of Leinster presided, resolved "that the king, lords, and commons of Ireland are alone competent to make laws binding the subjects of this realm; and that they would not obey or give operation to any laws, save only those enacted by the king, lords, and commons of Ireland, whose rights and privileges, jointly and separately, they were determined to support with their lives and fortunes." At a subsequent meeting in Ulster, resolutions, breathing still stronger language, were carried, but no acts of violence or insurrection were attempted. The volunteers, however, went so far as to nominate delegates to form a national convention, which actually met at Dublin in November 1783; and was followed by a national congress, which assembled at the same place in October 1784. One great object of these meetings was to bring about a parliamentary reform; but though much was effected towards the redress of the grievances complained of, this object could not be attained.

While the national and military assemblies were thus occupied in asserting their rights and privileges, the parliaments both of Ireland and Britain were engaged in discussing the same points, and many eloquent speakers entered the lists on both sides. In the Irish House of Commons, the cause of national independence was strenuously and ably advocated by Mr Grattan and Mr Flood; and though these champions of liberty failed in a great measure of obtaining the ends they had in view, the force of their arguments, and the splendour of their eloquence, carried conviction to the minds of all who heard them, and excited the admiration even of their opponents. Grattan particularly distinguished himself in these parliamentary discussions. He repeatedly brought forward motions for re-establishing the independence of the Irish parliament, for extending the commercial privileges of the nation, and for still further repealing the penal statutes against the Catholics, and removing their disqualifications. Though often discomfited, he was seldom overcome; though frequently foiled, he was never disarmed, but persevered with undaunted vigour and manly energy in his glorious career. So well were his patriotic endeavours appreciated, that he received a grant from the legislature of L.50,000, and raised for himself, in the hearts of his countrymen, a monument which will outlast the most durable fabric of sepulchral fame.

From these meetings and debates resulted several acts of the Irish and British parliaments advantageous to the interests of the former country. The independence of its parliament was acknowledged, its manufactures were placed on a more liberal footing, its commerce was extended and improved, and its Catholic inhabitants were relieved from some of their more degrading disabilities. A fair idea may be formed of the acknowledged state of Ireland at that period from the substance of a speech delivered by the late Mr Pitt, soon after his being appointed prime minister, in a committee of the British House of Commons assembled to consider the state of the commercial intercourse between Great Britain and Ireland. On the 21st of February 1785, Mr Pitt opened the debate, by calling on the committee to divest their minds of all bias and prepossession, which so much pains had been taken to excite and diffuse through every part of the kingdom. In treating that important question, he begged leave to recal their attention to what had been, and what then was the relative situation of the two countries. They would recollect that, from the revolution to a period within the memory of every man who heard him, indeed till within these very few years, the system had been that of debarring Ireland from the enjoyment and use of her own resources; to make that kingdom completely subservient to the interest and opulence of this country, without allowing her to share in the bounties of nature and the industry of her citizens, and without suffering them to contribute to the general interests and strength of the empire. That system of cruel and abominable restraint had, however, been exploded. It was at once harsh and unjust, and it was equally impolitic and oppressive; for though it might be necessary to the partial benefit of particular districts in Britain, it promoted not the real prosperity or strength of the empire. That system had counteracted the kindness of Providence, and suspended the industry and enterprise of man. Ireland was put under such restraint that she was excluded from every species of commerce. She was restrained from sending the produce of her own soil to foreign markets, and all correspondence between her and the colonies of Britain was prohibited, so that she could not derive those commodities but through the medium of this country. Such was the system that had prevailed, and such was the state of thraldom in which Ireland had been kept ever since the revolution.

Among other grievances under which Ireland then laboured, the mode of collecting tythes in kind was deemed oppressive; and, to remove it, an insurrection arose in 1786, among a set of people who took the name of *Right boys*. This continued till the following year, when it was quelled by an act of the legislature to prevent tumultuous assemblies and illegal combinations. When the first distressing indisposition of his late majesty appeared to render the appointment of a regent necessary, the popularity of the Prince of Wales induced the Irish parliament to offer him that high situation, free from restrictions by which it was intended to be fettered in Britain; but the speedy recovery of our revered monarch prevented the jealousy which such a distinction would have excited between the two countries.

The French revolution, which commenced about the same time, pregnant with mischief to the whole of Europe, while it sowed the seeds of disaffection and sedition in Great Britain, could not fail of engendering similar commotions in the "rotten state of Ireland." It was natural that the malcontents of that country should seize an opportunity so favourable to their designs; and the imposing air of liberality and universal toleration with which that revolution commenced, gave to its advocates in these kingdoms a colour of plausibility, which was but too soon sullied by the enormities of its promoters, and the wild and visionary proceedings of their imitators. In Ireland these proceedings began in 1791, with the formation of the society of United Irishmen, instituted with the avowed object of "forwarding a brotherhood of affection, a communion of rights, and a union of power, among Irishmen of every religious persuasion, and thereby obtaining a complete reform in the legislature, founded on the principles of civil, political, and religious liberty." By what means this association proposed to effect its object, was sufficiently evident by their constituting a *national guard*, distinguished by a green uniform, with buttons bearing the impression of a harp surmounted with a cap of liberty. A general muster of these guards was appointed at Dublin in December 1792; but before that period government had taken the alarm, and provided sufficiently for the prevention of so dangerous an assemblage. Baffled in this attempt to assemble a military force, which, like the volunteer corps, ten years before, might overawe the constituted authorities of the country, the society endeavoured to procure the co-operation of those respectable bodies, but without effect. It was more successful in its efforts to procure the assistance of the Roman Catholics, though that assistance was rather indirect. They assembled, and formed a catholic convention, which met in December 1792, and voted a respectful petition to the king, stating their claims, and offering to abjure those tenets which were considered most dangerous to the church and state. This prudent conduct induced government to grant many of their claims, and thus prevented their taking an active part in the disturbances excited by the United Irishmen.

These disturbances still continued; a national convention was appointed to be held at Athlone, and the peaceable part of the community was farther alarmed by the quarrels and excesses of two other societies of desperadoes, called *Defenders* and *Peep-o-Day Boys*, the former composed of the lowest order of Papists, the latter of Presbyterians of a similar description. To suppress these enormities, fresh acts were passed against seditious meetings and tumultuous assemblies, and a regular militia on the plan of that of England was organized. This last measure was deemed a serious grievance.

In 1794 came on the trials of some of the leaders of the United Irishmen, especially the secretary of the association. Napper Tandy and Wolfe Tone, its two principal founders, fled to the continent; and the secretary, who was condemned to a heavy fine and imprisonment, contrived to effect his escape. The views of these factious men had been investigated in the British House of Peers, and enough had transpired on the trials to evince, what was afterwards more fully proved by the actions of their party, that they had maintained a traitorous correspondence with the leaders of the French democracy. In the same year, Earl Fitzwilliam, a nobleman of amiable character, but an avowed Whig, and staunch friend to civil and religious liberty, was appointed lord-lieutenant; but as he was disposed to proceed farther in his concessions to the Catholics than the British government then deemed safe or prudent, he was speedily recalled; and the only advantage which that numerous body derived from his interference, was the permission to send their sons to Trinity college for education, and the establishment of the Roman catholic seminary at Maynooth.

After the dismissal of Lord Fitzwilliam the national discontents increased to an alarming degree, and the spirit of insurrection and revolt seemed daily to acquire fresh vigour. In 1795, associations, whose members were bound to mutual secrecy by the most solemn oaths, were formed in various parts of the country, and the persons and properties of obnoxious individuals were assaulted and plundered. At length government judged it necessary to exert itself with severity to prevent these disorderly proceedings and punish their authors. In 1796 the insurrection act was passed, investing magistrates and officers with powers which would have been deemed unconstitutional, but for a bill of indemnity which was brought into parliament, to defend such magistrates and others as should, in their loyalty, outstep the usual bounds of law. The *Habeas Corpus* act was also suspended, and corps of yeomanry cavalry were formed for preserving the internal peace of the country.

The machinations of the United Irishmen, or the Irish Union as it began to be called, and their intrigues with the executive government of France, were unfolded at the end of 1796, by another silly attempt of their French allies at invasion. On the 24th of December a fleet of French ships anchored in Bantry bay; but as the troops which were intended to join the Irish insurgents were on board other ships which had not yet reached the same destination, the French admiral, finding he was not likely to effect any thing of importance, left the coast and returned to Brest. In consequence of these demonstrations of rebellion, the government, on the 17th of May 1797, issued a proclamation, declaring the civil power inadequate to preserve the general peace, and the military were empowered to act against the insurgents according to their own discretion. The result of such a dangerous licence was, that the most oppressive acts were put in practice against persons in the least suspected of disaffection; but these strong measures had so far the desired effect, that the proceedings of the insurgents were carried on in a more secret manner; and in less than three months the preservation of the public peace was again intrusted to the civil authorities. In the mean time the Irish Union continued to increase in numbers and audacity. Above 100,000 individuals had joined it, and among them some persons of rank and property. A directory, similar to what had been recently established in France, was constituted; and Arthur O'Connor, one of its members, was sent to France, with full powers to negotiate a plan of alliance between the ruling powers of that republic and the Union. But as the schemes of the insurgents, in spite of their endeavours to keep them secret, were early suspected by government, the progress of O'Connor was narrowly watched, and he was arrested, in company with Coigly, an Irish priest, and Binns, a member of the London Corresponding Society, in his journey through England to embark for the continent on this important embassy, in February 1798. These three confederates were brought to trial on a charge of high treason, and Coigly was condemned and executed; but the proofs being insufficient to establish the guilt of O'Connor and Binns to the full extent of the indictment, they were acquitted, though the former was retained in prison on a new charge.

Many debates arose in the British and Irish parliaments, as to the most proper means of checking the alarming progress of these turbulent societies. The Earl of Moira and Mr Fox, then at the head of the opposition, recommended lenient measures, but they were over-ruled by the ministerial side; and as a full disclosure of the traitorous designs of the Union were made by one of their delegates in 1798, administration was compelled to have recourse to the most vigorous means of maintaining their authority. On the 30th March was issued a proclamation announcing this resolution; and General Abercrombie, then commander of the forces in Ireland, was dispatched into the most disaffected provinces, to overawe the insurgents by a military force. He fixed his head quarters at Kildare, and, on the 3d of April, published a manifesto, requiring the inhabitants of that and the adjoining districts to deliver up all arms and ammunition in their possession within ten days, under pain of being subjected to military law. As this intimation produced little effect, the troops were, at the end of the prescribed period, sent, at *free quarters*, among such of the inhabitants as were judged to be disaffected, whom they treated with the rigour customary on such occasions. Little intimidated at these manifestations of resistance, the insurgents continued their proceedings, and secretly appointed the 23d of May for a general rising of their whole force, computed to be little short of 500,000 men; and had not government been apprised of their intention, in time to ward off the blow, Ireland had been perhaps for ever lost to the British empire. The prime mover of the projected rising, Lord E. Fitzgerald, was arrested, and, as he made a desperate resistance, was mortally wounded in the scuffle. The plan of the rebels, as it had been unfolded to ministry, was laid before the Irish House of Commons by Lord Castlereagh; and proclamations of warning and menace were issued by Lord Camden, then lord-lieutenant, the lord-mayor of Dublin, and General Lake, who had succeeded Abercrombie as commander of the forces.

This timely discovery saved the country from a revolution, but did not prevent the partial rising of the rebels. It began on the 24th of May, and for some months Ireland was a prey to all the horrors of a civil war. The insurgents were assisted by some men of courage and military skill, especially Murphy, Roche, and Dixon, and, though they could never unite into a very formidable army, they were, in several districts, sufficiently numerous to withstand, and sometimes to defeat the royal troops, though commanded by experienced and brave officers. Before the end of May, Murphy, with 15,000 men, had defeated the military at Oulart, and taken possession of Enniscorthy and Wexford; while Roche, at the head of 10,000, worsted Colonel Walpole in the battle of Clough; but another body was defeated before Ross by General Johnson. On the 9th of June a desperate battle took place at Arklow, between Murphy's followers, consisting of 20,000 men, and a small body of the king's forces, under General Needham; but, after being several times repulsed, chiefly through the bravery of the Durham fencibles, the rebels were compelled to retreat with loss. On the 20th of June they assembled in great force at Vinegar-hill, near Enniscorthy, whither they were followed by General Lake, at the head of 13,000 troops, well disciplined, and provided with a large train of artillery. An engagement took place the following day. The rebels were first driven from Enniscorthy, and afterwards from Wexford, on the same day; and though they made a vigorous stand at Vinegar-hill, they were at last completely routed. General Lake was about the same time joined by General Moore, (who afterwards so much distinguished himself and fell at Corunna,) and thus reinforced, became so formidable, that the great body of the insurgents, after some desultory movements and a few slight skirmishes, dispersed, but not before several of their leaders had been secured. Some of them were immediately put to death by the General, and others were delivered over to the civil power.

On the 3d of July, Lord Cornwallis, who had just succeeded Lord Camden as viceroy, published offers of pardon and amnesty to such of the insurgents as would submit within a reasonable time, and had not been principal leaders or guilty of murder. This prudent and merciful measure so far put a period to the rebellion, that only a few straggling parties of the insurgents, chiefly Catholics, remained in arms, and before the end of the year all was quiet.

The Irish rebels had always expected effectual assistance from France, but it was delayed till it could render them no essential service. On the 22d of August 1798, a small body of French soldiers, consisting of about 1800 privates and nearly 100 officers, under the command of General Humbert, landed at Killala in the county of Mayo, and being joined by a few Catholics of the same district, advanced to Castlebar. They were followed by General Lake and General Hutchison with about 3000 troops, and on the 27th an engagement took place, which, to the general surprise of all parties, ended in the defeat, or rather flight of the British soldiers, who retired precipitately to Tuam and Athlone. After this unexpected victory the French marched towards the interior, and early in September posted themselves at Ballynamuck on the banks of the Shannon. Here they were again attacked by General Lake, and after a short action were obliged to surrender. In the meantime the French government had fitted out a more formidable armament to second the attempt of Humbert. It was preceded by a brig laden with arms and supplies, and having on board Napper Tandy, a chief of the United Irishmen already mentioned. The brig landed its cargo at Donegal, but Tandy, who then held the situation of a general of brigade in the French service, having learned the defeat and surrender of Humbert, reembarked and retired to Hamburgh, where he was arrested, and being brought to trial in Ireland pleaded guilty and received his majesty's pardon. The chief part of the armament was on board two squadrons, the one consisting of a line of battle ship and six frigates, and the other of three frigates. The former was encountered, on the 12th of October, by a British squadron under Sir John Borlase Warren, and totally defeated, with the loss of the line of battle ship, and three frigates captured during the action, and two more taken afterwards; and the other squadron, which anchored in the bay of Killala on the 27th of October, on the appearance of the British ships off the coast, was glad to escape without effecting a landing.

A *national union* between Ireland and Great Britain had been projected ever since the reign of Queen Anne; but, though during that reign it was proposed by the Irish House of Lords, it does not appear that it was ever popular to the country in general. But the formidable insurrection of which a brief account has just been given, determined government to attempt bringing about a measure which would render the future management of Ireland comparatively easy. By way of preparing the people for an official proposition of the subject in Parliament, a pamphlet on the arguments for and against a union appeared in 1798; and on the 22d of January 1799 the measure was brought before the Irish parliament by a message from the lord-lieutenant. The first day's debate was so far favourable to the plan, that it was carried by a majority in both houses, though in the House of Commons that majority was the smallest possible; on the next day the same branch of the legislature decided against it by a majority of five; but the full discussion and determination respecting the union was deferred till the following year. On the re-assembling of Parliament in January 1800, some able and animated debates occurred in both houses. It was first moved by the anti-unionists that the plan should be abandoned, but this motion was lost by a considerable majority. On the 5th of February Lord Castlereagh appeared at the bar with a message from the viceroy in favour of a union, and explaining the terms on which it was to be formed. On a debate on this message, the House of Commons expressed their approval of the measure by a majority of 43, and the House of Peers was still more favourable; but among the opposers of a union were some men of high rank, distinguished talents, and great influence, particularly Lord Moira, the Earl of Clare, (Lord Chancellor,) the Duke of Leinster, Lord Charlemont, Sir Lawrence Parsons, and Mr Grattan. They urged against the measure the following arguments.

That the representatives of a nation are not vested with the power of abolishing its independence, by the transfer of its sovereignty or its rights of legislation to any foreign country; that such a transfer, unauthorized by the general consent of the people, tended to the dissolution of the existing government, and the introduction of anarchy; that a local parliament, being best acquainted with the habits, dispositions, and prejudices of their constituents, and always on the spot to afford immediate relief to their wants, and guard against their excesses, was to be preferred to a foreign legislature, which could not be supposed so accurately informed as to the state of the people, and was at too great a distance to receive such information, or apply the proper remedies in sufficient time; that the Irish members, in the proposed Imperial Parliament, would, like some others, become the tools of ministry, and thus increase the influence of the crown, already too great; that the evil attending the absence of the great proprietors, then so justly lamented, would be much increased, augmenting to an intolerable degree the exhausting drain of money from the country, and abandoning the tenantry to the tyranny and oppression of interested agents, who were too apt to abuse the delegated power to gratify their own pride and avarice; that the absence of the bishops from their dioceses, in their necessary attendance on the Imperial Parliament, would lead to a neglect of the inferior clergy, and a negligence among them, and thus tend to increase the growth of irreligion, and to discourage literature; that, by this measure, the national importance of Ireland would be annihilated, and that she would be degraded from the rank of a kingdom; and that the concessions which, in the compact of union, should be made to Ireland, in return for these great sacrifices, might, at any future time, be cancelled or recalled by the Imperial Parliament, from its overwhelming majority of British members.

In answer to these plausible arguments against the union, it was contended by its advocates, That every government possesses an absolute power of maintaining order, enacting laws, and making occasional alterations in its constitution, for adapting it to those changes of circumstances which must necessarily take place in the course of human events; and that, according to the British constitution, such a power is vested conjointly in the king, the peers, and the representatives of the people; that the modification then proposed was not a surrender of independence, but an intimate conjunction with Great Britain, on terms honourable and advantageous to Ireland, a change, not a subversion, of the constitution; that the same arguments which denied the competence of Parliament for effecting this change, would equally militate against the validity of the act of union between England and Scotland, and thus deny the right of the present sovereign to the crown of the United Kingdom founded on that act; that, except through through their representatives in Parliament, the consent of the people could be collected only from the opinions of the well-informed, the reflecting, and the disinterested part of the community, to whom the proposed measure seemed to be desirable; that the advantages which Ireland derived from her local parliament, were more than counterbalanced by the disadvantages; that the feeble bond which then connected the two kingdoms might easily be broken by a disagreement between their different legislatures, a danger which had lately threatened in the late proposed regency; that under distinct legislatures, Ireland was excluded from many commercial privileges; that the boasted local parliament was founded rather on the pretensions of a few individuals to monopolise the government and resources of the country, than on a national basis or just representation, and was in fact only a weak and rapacious oligarchy, which considered the nation as its political inheritance, and was ready to sacrifice the peace and happiness of the public to its insatiate love of patronage and power; that a legislature superior to local prejudices, and remote from the baneful influence of party, could best overturn that oligarchical tyranny, and curb the violent spirit of faction by which the nation was so often distracted and oppressed; that the Irish representatives in the Imperial Parliament were not more likely to be unduly influenced by ministry than the existing Irish parliament, which contained 116 individuals holding places or receiving pensions; that the commercial advantages to be expected from the union would fully compensate for the increased evil of the absence of proprietors from their estates; that the necessary attendance of the bishops in the Imperial Parliament would not occasion such long or frequent absence as to prevent their rewarding merit in their clergy; that the intimate connection of the Irish with the British nation, was so far from being a derogation from the dignity of the former, that it would be productive of much political advantage, and that there was no more reason to dread any infringement of the proposed treaty of union than had been apprehended or experienced from the union of England with Scotland, or its homologation with Wales.

Partly by these arguments, and partly by the proper employment of that influence which ministry avowedly possessed in the Irish parliament, such a majority was obtained in both houses, that after many keen discussions, the Act of Union was passed in the House of Commons on the 5th of June, and in the House of Peers on the 13th of the same month. It was afterwards carried rapidly through its several stages in the British Parliament; and on the 2d of July 1800, it received the royal assent. By this act, which was to take effect on the 1st of January 1801, it was agreed that the representatives of the Irish nation in the Imperial Parliament should consist of four spiritual lords, to be changed every session; twenty-eight temporal lords, to be elected for life by the body of the Irish peerage; and of a hundred members of the House of Commons, namely, two for each of the 32 counties, two for the city, and one for the university of Dublin, two for Cork, and one for each of the following principal towns: Armagh, Athlone, Bandonbridge, Belfast, Carrickfergus, Cashel, Carlow, Clonmel, Coleraine, Downpatrick, Drogheda, Dundalk, Dungannon, Dungarvon, Ennis, Enniskillen, Galway, Kilkenny, Kinsale, Limerick, Lisburn, Londonderry, Mallow, Newry, Portarlington, New Ross, Sligo, Tralee, Waterford, Wexford, and Youghall. For every fifteen parts of the seventeen raised by Great Britain, it was stipulated that Ireland should, for the first twenty years after the Union, furnish two parts, and that after that period the proportion to be raised by each was to be adjusted by Parliament. In respect of trade and commerce, Ireland was placed much on the same footing with Scotland, and it is generally allowed that her privileges in that respect were greatly increased. This union, indeed, was never popular in Ireland, but the same unpopularity attended the Union between England and Scotland; and it is to be hoped that the mutual interchange of persons and interests, which have long ago reconciled the inhabitants of North Britain to a measure which has proved highly advantageous to them, will have the same effect with a people equally famed for their spirit, their generosity, and their good sense.

As the Union between Britain and Ireland has completely assimilated the interests and the transactions of both in one common centre, it would be out of place to enter into any detail with respect to the succeeding events that have taken place in the latter kingdom. Some of the most important have already been noticed at sufficient length under the history of Britain; and it is necessary here only to enumerate them in the order in which they have occurred.

In 1803, an insurrection, which excited some alarm, was raised by a few remaining leaders of the late rebellion, but it was subdued without any great exertion of political or military force. In 1807, an act was passed in the Imperial Parliament, on the motion of the present Duke of Wellington, then Sir Arthur Wellesley, for granting unusual powers to the lord-lieutenant and magistrates, for the more easy suppression of rebellion and insurrection, and another to prevent suspected persons from possessing arms. In 1809, the Roman catholics of Ireland, thinking their interests not sufficiently regarded, formed a committee to petition Parliament, and take such other legal steps as might be necessary to establish their rights. In the beginning of 1811, the proceedings of the Catholics became the subject of an official letter from the secretary of the lord-lieutenant, and were narrowly observed by government. In May of that year, the Catholic petition was refused by the Imperial Parliament, and the same fate has repeatedly befallen it from 1812 to 1821. In 1814 an act was passed permitting the sending to Ireland regiments of British militia, and bringing Irish regiments hither. In 1814 appeared a gang of desperadoes called *Carders*, who committed many enormities, and occasioned the passing of another insurrection act. In 1816, Ireland suffered severely from the scarcity of that year, but continued peaceable; and nothing of importance has since occurred to disturb its tranquillity, except a few partial tumults, which have lately caused certain districts to be proclaimed in a state of disaffection.

IRENÆUS, bishop of Lyons, is supposed to have been a native of Greece, and was born about the year 120 of the Christian era, and was the disciple of Polycarp bishop of Smyrna, who had been the disciple of the evangelist John. About the year 177 he was presbyter of the church of Lyons, and succeeded to that see after the martyrdom of Pothinus, during the persecution of the Christians under Marcus Aurelius Antoninus. Towards the close of the second century, Irenæus drew up a treatise against the prevailing heresies; and this is the only one of his works now extant, and of it only the first book is preserved in the original Greek. The persecution of the Christians being revived by the emperor Septimus Severus, the bishop of Lyons became one of the victims, and was put to death in the year 202.—*Mosheim's Church History*, Vol. I.

IRESINE, a genus of plants belonging to the Diœcia class.

IRIDIUM, a metallic substance obtained from crude platina, and constituting one of the discoveries of modern chemistry. See CHEMISTRY.

IRIS, FLOWER-DE-LUCE, or FLAG-FLOWER, a genus of plants belonging to the Triandria class.

IRKUTZK, a government of Russia, which includes the whole eastern part of Siberia, and one of the most extensive of the empire; has for its boundaries on the north the Frozen ocean, on the east the North Pacific ocean and the Aleutian islands, on the south Mongolia and Chinese Tartary, and on the west the governments of Tomsk and Tobolsk. It is traversed by an immense chain of mountains, which are rich in metallic ores, and clothed in many places with extensive forests, and contains many large rivers and spacious lakes. As this region extends from the 51st to the 74th degree of north latitude, it is distinguished by great diversity of climate. A mild and genial temperature prevails in the south, but in the northern districts the cold is so rigorous, that the powerful influence of the sun penetrates only a short distance under the surface of the earth. The population of the whole government exceeds 407,000; and the capital of the government, which has the same name, contains more than 20,000 inhabitants.

IRON, one of the most useful of the metals, as well as the most abundant. For an account of its ores and properties, see GEOLOGY and CHEMISTRY; and for its electrical and magnetical properties, see ELECTRICITY and MAGNETISM.

IRTISH, a large river of Siberia, which rises among the Altain mountains, and after traversing a lake and the government of Tobolsk, it falls into the river Oby. This river abounds with fish, and particularly the sturgeon.

IRVINE, a sea-port town and royal borough of Ayrshire in Scotland, stands on a rising ground near the bank of a river of the same name, which flows into the firth of Clyde. The church, which occupies an elevated spot, and its lofty spire, form a conspicuous object. The population of the town and parish, in 1811, amounted to about 6000. Cotton manufactures have been introduced. Ship-building and rope-making have been long carried on, and a bleachfield has been long established in the neighbourhood. A great deal of coal is exported; and the chief imports are, Baltic produce, and grain from Ireland and the southern districts of Scotland.

ISATIS, WOAD, a genus of plants belonging to the Tetradynamia class, one of the species of which, *Tinctoria*, yields a colouring matter.

ISCHIA, a small island in the bay of Naples, is about 18 miles in circumference, is supposed to be of volcanic origin, but in many parts is remarkable for its fertility, and produces abundance of excellent fruits. In the beginning of the 14th century this island suffered severely from a volcanic eruption. Besides several villages distributed along the shores, the capital of the island, which has the same name, is built on an insulated rock on the north coast.

ISERE, a department of France, derives its name from one of the principal rivers, and is bounded on the north and west by the departments of the Ain, the Rhone, the Loire, and the Drome, and on the south and east by the Drome, the Higher Alps, and Mount Blanc; covers a space equal to 453 square leagues, and its surface is diversified with high mountains, deep vallies, and barren and marshy plains. Part of the soil is occupied with the culture of grain and hemp, and with vineyards, but a great extent of it is devoted to pasturage. The Romanche, the Drac, and the Isere, are the principal rivers. Iron, copper, and lead have been discovered, and some of these minerals have been wrought.

The population exceeds 440,000, and the principal towns are Grenoble, Vienne, and St Marcellin.

Grenoble is the capital of the department, and stands at the confluence of the rivers Isere and Drac, contains some spacious streets and well built houses, and is defended by a wall and citadel. The number of its inhabitants exceeds 23,000, and the principal manufactures are woollen stuffs, hats, and gloves.

Vienne is the principal place of a district, stands on the banks of the Rhone, was founded by a Roman colony, and being afterwards erected into an archbishopric, became the capital of the province of Viennois. The population exceeds 10,000.

St Marcellin is also the principal place of a district, is 30 miles south-east from Vienne, and contains more than 3000 inhabitants.

ISLAY, one of the western islands of Scotland. See HEBRIDES.

ISLE OF FRANCE, an island in the Indian ocean, which is also distinguished by the name of Mauritius. See MAURITIUS.

ISLE OF WIGHT, an island in the British channel, is included within the jurisdiction of Hampshire, from which it is separated by the Solent sea, a channel from two to seven miles in breadth. The length of the island is stated at 23 miles, the breadth at 13 miles, and the superficial extent at 105,000 acres. The population exceeds 22,000. See HAMPSHIRE.

ISMAIL, a town of the province of Bessarabia, in European Turkey, stands on the north side of the Danube, and about 33 miles from the Black sea. It was strongly fortified, and was taken by storm in 1790 by the Russians, after being several times repulsed, and having lost 10,000 men during the siege. The Turkish garrison, amounting to 30,000 men, were massacred in cold blood, and the city was given up to plunder and every kind of licentiousness. The booty found in the city was immense.

ISNARDIA, a genus of plants belonging to the Tetrandria class.

ISOETES, Quill-wort, a genus of plants belonging to the Cryptogamia class.

ISOPERIMETRICAL is a geometrical term which is applied to such figures as have equal perimeters or circumferences; and the same term is applied to problems which are employed to determine the nature of a curve, from certain properties which it is supposed to possess in a greater degree than any other curve that may be drawn between given points, has the same length or perimeter, or includes the same area. The subject of isoperimetrical problems has engaged the attention and ingenuity both of ancient and modern geometricians.

ISOPYRUM, a genus of plants belonging to the Polyandria class.

ISPAHAN, a city of the province of Irack, and the capital of Persia till the seat of government was transferred about the end of the 18th century to Teheran, is situated in an extensive plain, and on the banks of a river, and in former times was of such extent as to require a wall of 20 miles circumference to enclose it; but it is now so much diminished as to cover a space of not more than three miles in diameter. Seen from a distance, Ispahan presents the appearance of numerous domes and minarets rising from groves of trees, for all the principal houses and public edifices are surrounded with gardens adorned with flowers, shrubs, and trees. This is particularly the case with the suburbs; for, in the older part of the city, the streets are narrow, irregular, and covered with mud or dust. The palaces of the Persian kings are splendid edifices, erected in spacious gardens, and surrounded with lofty walls. Some of the mosques are magnificent structures; and the city is furnished with numerous caravanseras, bazars or market-places, baths, and colleges.

The population of Ispahan was at one time estimated by some at a million, according to others at half a million; and from later accounts the number is stated at 200,000. Various manufactories have been established and particularly embroidery in gold has been brought to great perfection. Ispahan was formerly a place of great trade, and it is still the emporium of Asiatic and European commerce.

ISTRIA, a peninsular district, of a triangular form, lying to the north of the Adriatic sea, is bounded on the north by Carniola, and on the other sides by the sea, is about 80 miles in length from east to west, and about 75 miles from north to south. This district, part of which formerly belonged to the Venetian territory and part to Austria, is now altogether subject to the latter power. The surface of the country toward the sea is low and marshy, or covered with mountains, some of which are bare and rocky, and others are clothed with luxuriant forests. The soil in the vallies is fertile, and affords abundant crops of grain, and in many places excellent wines are produced.

The population of this territory is supposed not to be less than 200,000. Marble, timber, fish, salt, and wine are enumerated among the principal exports. The chief town of the district is Capo d'Istria, which is built on a rock or island which communicates with the land by means of a causeway, is about two miles in circumference, and is eight miles from Trieste, which stands at the bottom of a gulf of the same name, and has risen to great commercial prosperity since the middle of the 18th century. *Pola* is a small place, chiefly remarkable for the ruins of Roman edifices, and particularly of a magnificent amphitheatre. *Rovigno* is a place of considerable trade, contains 10,000 inhabitants, and is conspicuous for an elegant Gothic cathedral.

ITALY, a country in the south of Europe, which, in its general outline, has some resemblance to a boot, is bounded on the west by the Tuscan sea, on the east by the Adriatic or gulf of Venice, on the south by the Ionian sea, and on the north by the mountains of Switzerland, and from north-west to south-east stretches nearly 700 miles in length, from the 47th to the 38th degree of north latitude, while it varies in breadth from 100 to 200 miles. This region is described by the ancient poets under various names, as *Saturnia*, from Saturn, who was supposed to have found an asylum in it when he was driven from Crete by Jupiter; *Latium*, from the Latins, the ancestors of the Romans; *Oenotria* and *Ausonia*, from the Ausones and Oenotrians; *Hesperia*, from its position to the westward of Greece; and *Italia*, or Italy, from Italus, a king of some of the districts. Some of these names, originally limited to particular provinces, were afterwards extended to the whole country.

In ancient times of its history, Italy was divided into many small states and kingdoms; but when the Gauls settled in the western parts, and the Greek colonies occupied the eastern districts, it was divided, with respect to the inhabitants, into three great parts,—Cisalpine Gaul, which included the northern districts; Italy Proper, comprehending the central districts; and Magna Grecia, or Great Greece, composed of Sicily and the provinces contiguous to Greece, and peopled by colonies from the Peloponnesus. But in the progress of the Roman arms, the whole of these divisions fell under the authority of that people.

Mountains.—Italy is separated from Germany, Switzerland, and France by the Alps, and the ridge of the Apennines extends through its whole length, and, in its course, smaller ridges branch off, forming numerous districts and vallies, peculiarly distinguished by their climate and productions.

Rivers and lakes.—Italy is well watered by numerous rivers. The Po rises in the north, receives in its progress many tributary streams, and, after a course of 300 miles, discharges its waters into the gulf of Venice. The Adige has its source in the mountains of the Tyrol, and, flowing to the southward and eastward, falls into the same gulf. The

Arno has its origin in the Apennines, passes by Florence and Pisa, and flows into the gulf of Genoa. The classical Tyber rises in the same ridge, and, after a course of about 150 miles, joins the Tuscan sea.

Italy is adorned with many spacious and beautiful lakes. Lake Maggiore is 27 miles in length, and from seven to eight miles in breadth, and is studded with the Borromean islands, which are remarkable for fine scenery. The lake of Como is 50 miles long, and in some places 600 feet deep; and some other lakes are from 20 to 30 miles in length.

Mineralogy.—In many of the mountains of Italy the prevailing rocks are limestone, from which are obtained some of the most beautiful marbles. Rich mines of iron have been discovered in several places, and some other metallic ores are also met with. From the alum-stone of Tolfa, containing the ingredients of that salt, alum is manufactured. Rock salt is found in Calabria; and native sulphur is collected for the purpose of commerce on Ætna and Vesuvius.

Climate.—The climate of Italy, from its situation, is peculiarly genial and temperate. From the inequality of the surface, it presents considerable diversity. In the warmer and more sheltered districts, the soil affords the vegetable productions of tropical regions, while the productions of the more elevated tracts resemble those of the middle districts of Europe.

Agriculture.—The soil of many parts of Italy, especially in the vallies and near the level of the sea, is rich and productive, and rice and corn are produced in abundance. The dairy is an object of great importance, particularly in those districts where the celebrated Parmesan cheese is manufactured. Many of the fruits of tropical regions grow to perfection; and the grape and the olive, yielding wine and oil, are successfully cultivated.

Manufactures.—As silk, wool, and cotton are the native productions of some parts of Italy, manufactures from these materials have been established. The rich velvets and damasks of Genoa and Venice have been long celebrated; and the silk stuffs of Florence and Milan are not held in less estimation. The manufacture of porcelain has been brought to great perfection; and Naples has been long distinguished for splendid works of embroidery.

Literature.—Italy has been peculiarly distinguished, both in ancient and modern times, in the history of literature; and the learned institutions in almost all the principal cities have afforded, in their Transactions, sufficient evidence that the profounder researches of science have not been neglected. Music and poetry have long flourished; and many of the Italian writers are unrivalled in history.

Fine arts.—In painting, sculpture, and architecture, Italy stands conspicuous both in ancient and modern times. The modern churches and palaces shew to what perfection architecture has been carried; and the paintings in fresco and oil, which adorn many of the public buildings, are unrivalled productions. The progress and improvement of sculpture are sufficiently exemplified in the numerous statues, busts, inscriptions, and bas-reliefs, which the lovers of art may contemplate and admire in Rome alone, while the magnificent ruins of temples, amphitheatres, baths, bridges, and triumphal arches, in all parts of the ancient Roman territory, attest the ingenuity and opulence of former ages.

Government.—In different periods of its history, Italy has been subject to very different forms of government. Since the overthrow of the French power under Bonaparte, the southern parts of Italy, including Naples and Sicily, have been restored to the former king Ferdinand; the former territory of the church was assigned to the Pope; Florence, Sienna, Lucca, and Pisa, are united under Charles, son of the late king, and constitute the kingdom of Etruria; the northern parts of Italy, comprehending the duchies of Milan, Mantua, and Modena, with Verona, Padua, and the Venetian territory, form the kingdom of Venice and Lombardy, which acknowledges the sway of the emperor of Austria; and Savoy, Piedmont, and Genoa are held by the king of Sardinia.

For fuller information relative to Italy, the reader is referred to the different countries and cities described in the order of the alphabet in this work; or he may consult Moore's *View of Society and Manners in Italy*; Swinburne's *Travels*; Spallanzani's *Travels*; or Eustace's *Classical Tour*.

ITHACA, an island in the Ionian sea, which is celebrated in the poetry of Homer as the kingdom of Ulysses, still retains the same name, is about 18 miles long, and in most places about five miles broad; produces various fruits, and particularly almonds, olives, and the small species of grape sold in this country by the name of currants. The population is estimated at 8000, a fourth part of which is collected in the principal town.

JUAN FERNANDEZ, an island of the Pacific ocean, in south latitude 34° 40′, and more than 100 leagues west from the coast of Chili, is about 15 miles long and six miles broad, presents in many places a mountainous aspect, and abounds with esculent vegetables and excellent water, which has rendered it a favourite place of refreshment for the crews of ships that have been long at sea. Some of the earlier circumnavigators having stocked this genial spot with goats, a breed of these animals multiplied so fast, that the Buccaneers, who annoyed the trade on the western coast of South America, visited this island to obtain fresh provisions. To deprive their enemies of this resource, the Spaniards transported a great number of dogs, by which the goats were nearly extirpated.

The only safe harbour is on the north side of the island. In this harbour, Commodore Anson remained three months in 1741, after his little squadron had suffered severely from storms, and the scurvy had made great inroads on his crew. The Spaniards retain possession of this island.

Juan Fernandez is memorable as the scene of the popular romance of the adventures of Robinson Crusoe, a work which was suggested to the author, Daniel De Foe, by the narrative of Alexander Selkirk, a Scotch mariner, who having some difference with the captain of the ship in which he sailed, was put on shore in this uninhabited island, and after a solitary residence of four or five years returned to Europe in an English ship which touched at the island about 1710. According to one account, Selkirk's notes were put into the hands of De Foe for the purpose of being prepared and arranged for publication; and the author having embellished the materials with the fictions of a lively fancy, converted them to his own use. Alexander Selkirk was a native of Largo in Fife; and about the year 1798, the chest and musket which he had with him on the island were in possession of his grandson.

JUDÆA, otherwise denominated *the Land of Canaan, the Holy Land*, or *Palestine*, is an extensive tract of country in the south-west of Asia, now forming part of the province of Syria in the Turkish empire, and remarkable for having been the scene of most of the transactions recorded in holy writ. It is not easy to fix the limits of the country according to modern geographical estimate; but it may be generally stated as lying between 29° 50′ and 33° 30′ of north latitude, and between 35° and 37° of east longitude. At the northern extremity it is very narrow, but gradually widens towards the south. It is bounded on the north, and partly on the east and west, by Damascus and Phœnicia; on the south, by Desert Arabia; on the west, partly by the Mediterranean sea; and on the south-east by part of Arabia.

The *general appearance* of the Holy Land is striking and picturesque. The prominent features of the country are hills, mountains, and lakes, with occasionally an extensive plain. It is for the most part open, natural wood being scarce; but the prospect is often enlivened by plantations, while the plains are intersected with streams. Fountains or wells are frequent in what are called the *deserts*; a name which there implies not a sandy sterile district, but an extensive uninhabited plain. The line of sea-coast is short, and nearly straight from north to south, with very few indentations or remarkable promontories. By the latest accounts, it appears that the middle and southern parts of Judæa, as being best cultivated, present the most pleasing aspect.

Mountains.—A series of hills extends through the country from Mount Libanus to the Dead sea, forming several smaller chains, extending generally from north to south, or inclining to the east, and a few detached and insulated hills standing in the midst of an extensive plain, in the neighbourhood of a lake, or at the head of a rivulet. Some considerable groupes form the immediate boundaries of the country on the north, east, and south. The principal chains properly belonging to Judæa are Mount Carmel, a woody ridge in the north-west, extending from the bay of Acre in a south-easterly direction towards Sichem or Napolose, where one part of it was called Gerizzim, and was the site of the Samaritan temple; Gilboa and Ephraim, two ridges in the province of Samaria; and a remarkable groupe of hills which nearly encompass the lake or sea of Galilee, comprising *Kern-el-hatti*, or the mountain of beatitudes, on which Christ is supposed to have preached his famous moral sermon, and the mountain of the multiplication of bread, where he miraculously fed the multitude. Among the insulated hills, mount Tabor stands pre-eminent in the plain of Esdraelon in Galilee. It is of considerable elevation, and, at a distance, seems of a conical form, but terminates at the top in an extensive plain. On the borders of Judæa stand Mount Libanus, famous for its excellent timber; Hermon; Mount Gilead, on which grow the trees that produce the balsam or balm of Gilead; and Mount Abarim, from one of whose summits Moses beheld the promised land.

Rivers.—The Holy Land contains only one considerable river, the *Jordan*, which rises among the hills of Hermon, and flows in a winding course from north to south, till it is lost in the waters of the Dead sea. In its progress it forms a large lake, traverses the sea of Galilee, and receives several tributary streams. The course of this river is so rapid, that it is said to flow through the sea of Galilee in a perceptible current. The smaller rivers are chiefly, the Kishon, which has its source in the western side of mount Tabor, and joins the Mediterranean near the bay of Acre; the Jabok, rising at the foot of mount Gilead, and uniting its waters with those of the Jordan, as the latter emerges from the sea of Galilee; the Arnon, which rises among the hills on the south-east of Judea, and pursuing a very tortuous course towards the north-west, falls into the Dead sea; and the brook or torrent Kedron, which, rising from the hills to the north of Jerusalem, flows with an impetuous current past the eastern walls of that city, and taking a south-easterly course, empties itself into the Dead sea. The small rivers are nearly dry in summer, and even the Jordan then becomes a sluggish brook as it approaches its final destination.

Lakes.—Two large and several small lakes are situated in Judæa. The largest is the lake *Asphaltites*, or the Dead sea, now called Almotanak, in the south and lowest part of the country. It is about 70 miles long from north to south, and about 18 broad, but its true dimensions have not been exactly ascertained. It is bounded on the north by the plain of Jordan, and on the east and west sides by lofty mountains. Its waters are very clear, but so strongly impregnated with an acrid bitter salt as to have a greater specific gravity than sea-water. Hence this lake was formerly called the Salt sea. With the water is also mixed a bituminous substance, having a strong sulphureous smell; it is seen in masses floating on the surface; and a similar matter, but of a harder consistence, is found upon the shores. Sulphur, rock-salt, and sulphureous limestone, also occur on the borders. From the gloomy grandeur and sterility of the environs of this lake, and the circumstance of its being the site of the ancient cities of Sodom and Gomorrah, many marvellous stories have been related of it which late travellers have proved to be untrue;—as, that no living being, either animal or vegetable, is to be found in it; that so strong a mephitic exhalation rises from its surface as to impregnate the superincumbent and surrounding atmosphere, and prove fatal to birds that attempt to fly across it; and that fruit grows on its banks agreeable to the sight, but dry and bitter to the taste like ashes. It now appears, that fish and testaceous animals exist in the lake, and stunted shrubs grow upon its shores; that the air, though heavy and often foggy, is not deleterious; that birds skim along the surface in pursuit of insects; and that the *apple of Sodom* is the fruit of a species of *solanum*, which, when penetrated by a certain insect, becomes dry and powdery on the inside, while the rind preserves its natural appearance,—or perhaps of a peculiar shrub, which, growing in such a situation, yields berries of little succulency, and containing bitter seeds. By analysis, the water of the Dead sea is found to contain about 1-4th of its weight of salts, chiefly muriates of lime, magnesia, and soda, and sulphate of lime. The mountains which bound this lake on the east have a very peculiar appearance, resembling a straight wall, scarcely indented or undulated along the upper line, while those on the west have the usual irregular and waving form. Contiguous to the lake are several hot-springs.

Second in size, but first in celebrity, is the lake of Gennesareth, otherwise called the Lake or Sea of Galilee, and the Sea of Tiberias. It is situated on the eastern side of Galilee, where it occupies a space of about 18 miles long and five or six broad. In general, its surface is smooth and placid, and its water remarkably clear and sweet, shewing a pebbly or sandy bottom, covered with shells; but as the lake is nearly surrounded with lofty hills, with occasional openings between them, the water is easily ruffled, and sometimes strongly agitated during windy weather. The small lakes are, Phiala or Hyala, near the source of the Jordan, and Bahr-el-houbi, or the Samachonite lake, an expansion of that river some miles to the north of the sea of Galilee.

Soil and climate.—The soil of Judæa, though often rocky and thin, is extremely fertile, and produces herbage and shrubby plants in abundance. Where cultivation is neglected, the ground is covered with tall weeds; and where it is successfully carried on, two luxuriant crops are generally reaped in one year. The lower grounds are of course most fertile, especially the plain of Zabulon, the plain of Esdraelon, and the low country of Judæa. Some parts of Galilee are stony and barren, but the most unproductive district is the neighbourhood of the Dead sea. Some of the hills are covered with lofty trees, and all of them, except the mountains which bound the Dead sea, appear capable of cultivation. The general substratum of the soil is limestone. The climate is temperate in winter, but so extremely hot during the summer months that Fahrenheit's thermometer often stands at above 100 degrees in the shade, and in the open air the sun is so intolerable as to render travelling during the day both inconvenient and hazardous. Yet the air is generally salubrious, and, except the plague, which often rages, but is not always very destructive, few diseases are known among the inhabitants. In the middle of summer the sun is sometimes so intensely hot that bread may be baked, or meat broiled, by exposure to its rays; but in the neighbourhood of the lofty mountains the heat is moderated by the snow, which almost constantly remains on their summits. A suffocating wind, called *simoom*, resembling the sirocco, sometimes blows, and produces the most distressing effects.

The *productions* of the Holy Land are in many respects highly interesting. Among the minerals are found limestone, marbles of various shades and qualities, trap, amygdaloid, gold in small quantities, iron, and copper. Many of the hills are composed almost entirely of compact limestone, others of chalk, and some appear basaltic. Among the vegetables may be particularly remarked the *cactus ficus indicus*, or prickly pear, which grows to a great height, forming impenetrable hedges, and producing a striking effect from its thorny stems and leaves, and its brilliant fruit; the globe thistle, and some other species, which there shoot up in great luxuriance; the Galilean pink, a peculiar species of *Dianthus*, tulips, carnations, the white and red rose, the white and orange lily, and the olive, the pomegranate, and the fig-tree, which grow and produce fine fruit, almost without culture. The prevailing trees are sycamore, nopal, fir, and various species of palm, and in some favoured spots the cedar and the oak. Various species of wild quadrupeds are seen, as antelopes, jackals, the jerboa, or saphan, supposed to be the coney described in scripture as residing among the stony rocks, wild boars, wild asses, and hares. The most interesting birds are partridges, especially of the white species, woodcocks, quails, found chiefly in the vale of Jordan, blue pigeons, jays, and a non-descript bird called by Volney *samarmar*, which sometimes appears in great flocks in pursuit of locusts. Serpents are very common, and lizards of various species bask in the sun among the deserted ruins. Many kinds of fishes are found in the Jordan and the lake of Gennesareth, especially the *sparus galilæus*, a species of silurus, and some others, which resemble the fishes found in the Nile. Some peculiar shell fish, as the *buccinum Galilæum* of Dr Clarke, have also been observed in the same lake. The form and nature of the fishes found in the Dead sea have not been accurately examined. Insects are numerous, particularly wasps, locusts, and fleas. These last are among the greatest pests with which travellers in the Holy Land are annoyed; they swarm in every house, even on the stone floors and roofs, so that a night's repose or an hour's sleep is sought in vain by any whom habit has not rendered insensible to their bite.

Agriculture.—The state of husbandry depends on the degree of protection afforded to the people by their Turkish governors, the pachas and agas. Where they are treated with liberality, as in the southern parts of the country, every spot of ground is cultivated, and even the rocky hills, covered with artificial soil and laid out in terraces, are clothed with crops of grain, or plantations of fruit trees or vegetables to their very summits; wheat, barley, maize, millet, and doura, are the most common grains, and beans, lentils, onions, cotton, and tobacco, are often planted to a great extent. The prevailing fruit trees are the vine, the olive, the date, the fig, the apple, and the lemon, and melons, cucumbers, gourds, and pompions, occupy many of the vacant spaces. Cattle, sheep, and camels, graze in the vallies, and goats among the recesses of the hills. The produce of the ground is removed on the backs of asses and camels, and the grain is threshed out by the feet of oxen, and ground between two stones into coarse meal. The plough usually employed is small, and without wheels.

In *manufactures*, trade, commerce, and the arts, Judæa is behind even the other provinces of Turkey. So oppressive is the government, that the wretched inhabitants think themselves fortunate in being allowed to enjoy the produce of their labour in its simplest form, without attempting to export it to a foreign market, or manufacture it into any thing beyond the coarsest necessaries of life. The hair of their camels is woven into stuff for clothes, and the skins of their sheep and goats are either tanned for sandals or rudely dressed as coverings for tents. Their cotton is worked up into cloth for shirts and turbans, and the bricks employed in building are generally baked in the rays of the sun. Though abundance of corn, wine, and oil is frequently produced, they are seldom allowed to export the superfluity; and even the ordinary articles of internal traffic sold in the shops or bazars are not exposed to public view, as in most parts of Turkey, but are disposed of privately, and as if by stealth. In this way, manuscripts, gems, medals, and reliques, are procured by travellers and pilgrims, and one necessary of life is exchanged for another. Crucifixes and beads for rosaries form one of the peculiar manufactures of the large towns.

The *inhabitants* of the Holy Land are of the most mixed and multifarious description. Turks, Arabs, Druses, Greeks, Armenians, Franks, Latins, and Jews constitute the chief population of the country; but it is impossible to estimate the number of each or calculate the aggregate of the whole. They differ in dress, manners, character, employment, and political estimation. The Turks, as the lords of the country, hold the chief posts of honour and command, both civil and military; they reside in the best buildings, wear their own national costumes, pass their time in listless idleness, and behave towards the other inhabitants with haughty insolence, unrelenting cruelty, and rapacious oppression; but they are most severe against the Christians. The Arabs are very numerous even in the interior, but more so on the confines. The former are generally peaceable, leading a pastoral life, dressed in loose garments of cotton and camels hair, bound about the waist with a girdle, with sandals on their feet, and a handkerchief about their heads, living in tents, and subsisting on the produce of their flocks and herds. The Arabs of the desart, or Bedouins, are ferocious savages, living by plunder, or by exactions from travellers by whom they are employed to guide or escort them from place to place. They ride on fleet horses, armed with a long lance, and generally a firelock. The Druses, though not properly inhabitants of the Holy Land, their chief residence being about mount Libanus, are found in straggling parties in almost every part of the country. They are a very peculiar people, inoffensive, industrious, and hospitable, but remarkably superstitious, and professing a religion made up of pagan rites, and of doctrines that are neither Jewish, Mahometan, nor Christian, but a strange mixture of them all.

The Greeks, Armenians, Franks, and Latins constitute the bulk of the Christian population. The Greeks are the most numerous, some towns, as Nazareth and Tiberius, being almost entirely inhabited by them. The other three denominations are chiefly ecclesiastics, who reside in the numerous Christian convents which have been established for the entertainment of pilgrims and preserving the memory of the various scenes of Christ's life and miracles. The Armenians are held in some respect by the Turks, and their superior lives in much pomp and eastern magnificence; but the rest are in the most degraded and oppressed condition, subject to the continual exactions and robberies of the Moslems, and in case of reluctance or inability to satisfy the avarice of their tyrants, exposed to all the dangers of imprisonment, torture, or even death. All this they endure with the utmost constancy and patience, rather than abandon the sacred trust committed to their charge; and though they themselves live in the most simple and abstemious manner, they contrive to entertain pilgrims and travellers hospitably and even luxuriously, dispensing to their European guests game, tea, wine, and other delicacies. But the most wretched part of the population are the Jews, the ancient and rightful owners of the country. Very few of them remain in Judæa, and they reside chiefly in a particular quarter of Jerusalem, near the site of the temple. Here they occupy a few miserable hovels or cellars, and exhibit the most melancholy picture of squalid poverty and wretched infatuation, passing their time in contemplating the spot where once stood the majestic edifice where their fathers worshipped the Deity, and living in daily expectation of the appearance of that Messiah who is to redeem them from temporal slavery, collect them once more into a nation, and lead them to honour, glory, and conquest.

The *manners* and *customs* of the inhabitants of Judæa have few differences from those of the other subjects of the Turkish empire, besides what have been noticed in the preceding paragraphs. They universally drink coffee, and generally smoke tobacco. The houses are usually low, built of wood or brick, and either flat at the roof, or finished with one or more domes. Camels and asses are used in travelling and conveying luggage and merchandize. The practice of watering cattle at the wells by women, who draw the water and carry it on their heads or shoulders in pitchers, described in Genesis, still continues, and the same disputes about precedency in that privilege take place. The women are employed in other servile occupations, especially in grinding corn, one holding the lower mill-stone, while the other moves the upper quickly backwards and forwards by a handle.

Religion.—Although Moslemism be the established religion of Judæa, all other religions are tolerated. Of the Christian faith, the Greeks, Armenians, and Roman catholics form the only sects, and their tenets and superstitious observances tend rather to degrade than to elevate the religion they profess in the opinion of its enemies; while they, in some measure, appear to excuse the severities exercised on those religious devotees. In no part of the civilized world does Christianity seem to be less pure or less enlightened than in the country where it originated.

Divisions.—The Holy Land is still divided by travellers into the districts formerly denominated Judæa, Samaria, Galilee, Peræa, and Decapolis, though only the first three are generally mentioned. Under the Turkish distribution of the province of Syria, Galilee is subject to the pacha of Acre; Samaria, Decapolis, Peræa, and most of Judæa, to the pacha of Damascus; and the remaining portion, more particularly called Palestine, comprehending ancient Philistia, to the pacha of Gaza. The chief towns are Jerusalem, Jericho, Napolose, and Bethlehem, in the pachalic of Damascus; Sephouri, Nazareth, and Tiberias in the pachalic of Acre; and Rama and Jaffa in the pachalic of Gaza.

Jerusalem, the Holy City, the metropolis of Judæa, is situated on the west side of the brook Kedron, in 30° 48′ of north latitude, and 30° 20′ of east longitude. It formerly occupied two hills, mount Moriah,—the supposed scene of Abraham's intended sacrifice of his son,—and mount Zion; but at present it is confined to the former, and is separated from the latter by a deep ravine. Similar hollows bound it on the north and east, where lies the valley of Jehoshaphat, with the Kedron flowing at the bottom. The general form of modern Jerusalem is an irregular oblong square of scarcely three miles in circuit. The city is surrounded with a wall, flanked with towers, and furnished with six gates,—two on the north, called the gates of Damascus and of Ephraim; one on the east, called St Stephen's gate; one on the west, the gate of Jaffa; and two on the south, denominated Zion-gate and the Dung-gate. The general appearance of the city at a distance is variously described, according to the quarter from which it is approached, and perhaps according to the different feelings of the traveller. By Dr Clarke, who first saw it on the road from Samaria, it is represented as a magnificent spectacle, surpassing any thing that he could previously have conceived; displaying a grand assemblage of domes, towers, palaces, churches, and monasteries, glittering in the sun's rays with inconceivable splendour; while M. de Chateaubriand who advanced towards it from the south-east, about the same period but some months later in the year, describes it as resembling a mass of rugged rocks. All agree that the streets are narrow, dirty, and unpaved; the houses heavy, low, and mean, without chimnies, and having no windows except near the roof, which is either flat or terminated by low domes; and that the walls are weak and thin, and the place altogether incapable of resisting the attack of an army provided with artillery. Being built on the eastern declivity of mount Moriah, and having the mount of Olives on the east of the valley of Jehoshaphat, it is overlooked on all sides by commanding heights. It contains about 30,000 inhabitants, including people of almost all nations and religions. The most populous part of the city is on the west, where the houses are much crowded; but in the eastern quarter the buildings are few and thinly scattered. The principal edifices are, the mosque of Omar, a large and majestic structure in the Moorish style of architecture, erected on the site of the ancient temple, and forming the chief place of Mohammedan worship, but religiously closed against the intrusion of Christians or Jews; the Franciscan convent of St Salvador, a spacious building resembling a fortress, near the north-west angle of the walls, supported by the donations of European princes, and containing ample accommodation for lodging and entertaining pilgrims; the Armenian convent, surpassing the former in size and splendour; and the hospital of St Helena, for the reception of sick or indigent Moslems, without the walls. On mount Zion is the citadel, a Gothic fortress nearly in ruins, and furnished with a few old cannon on carriages without wheels. The Jews have a wretched building which they call their synagogue, and most of the other sects have places of worship little superior. The church of the Holy Sepulchre, once so famous, and built by Hellena mother of the Emperor Constantine, on the spot which was supposed to be mount Calvary, and to include the real sepulchre of Christ, was entirely destroyed by fire, soon after Dr Clarke quitted the Holy Land. It is minutely described in his travels, Vol. II. 4to, and by Deshayes, as quoted by De Chateaubriand. Many other monuments and remains are also found in and about Jerusalem, and will be enumerated under the head of *Antiquities*. The city is garrisoned by about 8000 Turks, under the command of an aga or governor, and the civil administration is entrusted to a cadi.

Jericho, situated on the west bank of the Jordan, a few miles from where it enters the Dead sea, is now an inconsiderable village, inhabited by Arabs. *Napolose*, the ancient Sichem, formerly the capital of Samaria, and still a considerable town, stands in a rich and beautiful vale between mount Gerizzim and mount Ebul. It is surrounded by gardens and plantations, and is one of the most interesting towns in the Holy Land. *Bethlehem* is still a town of consideration, inhabited chiefly by Arabs. It stands on an eminence to the west of Kedron, and within sight of the Dead sea, and only a few miles to the south of Jerusalem. It retains many vestiges of antiquity, and affords ample proof of its having been the birth-place of the Messiah. *Nazareth* stands on the brow of a rocky eminence, looking towards the east, not far from the head of the bay of Acre and some miles distant from the sea of Galilee. It consists of but few houses, and is inhabited chiefly by Greeks. *Sephoury*, formerly a city of some consequence, and named Sapphoura, is now a small village between Acre and Nazareth, remarkable only for a religious edifice erected over the spot where St Joachim and St Anne, or Zechariah and Elizabeth, are supposed to have resided. *Tiberias*, situated on the south-west border of the sea of Galilee, is inhabited chiefly by Greeks and Jews, but has a Turkish garrison. It is surrounded with walls, and protected by a castle, but without artillery. Near it is a medicinal spring, forming the baths of Emmaus. *Jaffa*, the ancient *Joppa*, on the coast of the Mediterranean, is the principal sea-port of Judæa, and the second town of any note in the Holy Land. It is well fortified, has a strong garrison, and is provided with cannon; but the harbour is dangerous, and the anchorage bad. The streets are laid out in terraces on the declivity of a hill, and the houses are well built of stone. The population is about 7000, and consists chiefly of Turks and Greeks. It contains three Christian convents. Jaffa has been the scene of many military transactions, and was successively occupied by the French and British troops during the Revolutionary war. In 1801 it was nearly depopulated by the plague. *Rama*, or *Ramle*, supposed to be the Arimathea mentioned in the New Testament as the birth-place of Joseph who buried the body of Christ, is delightfully situated in a rich and fertile valley on the road from Jerusalem to Jaffa. It is a large town, and contains a convent called the Monastery of the Holy Land. This town was also desolated by the plague of 1801.

The *antiquities* of Judæa are numerous and interesting, but it is not easy to assign to many of them their real origin and epoch. M. de Chateaubriand has attempted to arrange those of Jerusalem under six heads, according as they appear to have been erected by the Hebrews—the Greek and Roman governors, or their dependents in pagan times, and in the first ages of Christianity,—the Saracens or Moors,—the Gothic princes of Christendom,—and the Turks, though no monuments of importance of this last class seem to exist.

1. Of the few legitimate Hebrew remains, the public wells in the vicinity of the large towns form a prominent example. The most remarkable are, Jacob's well near Napolose, supposed to be that on which Christ conversed with the woman of Samaria, and the well of David, just without the walls of Bethlehem. The pool of Bethesda at Jerusalem is another interesting remain of this class; and to the same head may be referred the large stone or earthen water-jars found in some parts, especially near Cana in Galilee,—the catacombs observed in the hills that bound the lake of Gennesareth,—and some of the sepulchres on the side of mount Sion.

2. To the second class appear to belong some tombs in the valley of Jehoshaphat and the vale of Siloe, the pool of Siloam, and the sepulchres of the kings to the north of Jerusalem.

3. The principal monuments of the third class are, according to Chateaubriand, most of those numerous churches, convents, and monasteries, which are scattered over the whole country, especially at Jerusalem, Bethlehem, Rama, Nazareth, and Tiberias, most of which are attributed to Hellena, mother of the Emperor Constantine. Thus, at Bethlehem, is shown the church of the nativity; at Nazareth, a Franciscan convent and the church of the annunciation; and at Tiberias, an ancient church called the house of Peter, with many others.

4. The only Moorish monument of importance is the mosque of Omar at Jerusalem; and, 5. The only strictly Gothic remains are the tombs of Godfrey of Boulogne, and Baldwin count of Edessa, erected within the late church of the Holy Sepulchre.

History.—In tracing the history of Judæa, it is proper not only to give a general account of the changes which have taken place in that country from the earliest records to the present time; but also to bring under one connected and comprehensive view the principal events in the history of the Jews, both when they resided as strangers or captives among foreign nations, and when they occupied the Holy Land. Of those transactions which are fully recorded in the Scriptures, only a brief notice is necessary, but those which are stated by profane historians will be more particularly described.

About 1920 years before the birth of Christ, Abraham, the founder of the Jewish nation, and the ninth in descent from Noah, left Haran in Mesopotamia, and took up his residence in the land of Canaan, then inhabited by several idolatrous tribes, the descendants of Ham. At that time, most of the country was subject to Chederlaomer, king of Elam, and though most of the inhabitants were pagans, at least one tribe, probably the Jebusites, were instructed in the true religion by Melchizedec, king of Salem, who also exercised the office of high-priest. About 18 years after his arrival, Abraham was engaged in a contest with Chederlaomer in behalf of his nephew Lot, and, with only his own domestics, defeated that prince and his allies. Sixteen years after, Sodom, Gomorrah, and some other cities of the Canaanites, covering with their environs a space of above 100 square miles, were overwhelmed, and their place occupied by the Dead sea. Abraham continued to reside chiefly in Canaan, leading a pastoral life, and living in tents, for about 100 years, and on his death left the dignity of patriarch to his only legitimate son Isaac, then about 75 years old. About 1739 A. C. Jacob, the younger son but declared heir of Isaac, returned to Canaan after an absence of 20 years at Haran, having acquired a numerous family and great possessions; but within little more than thirty years, in consequence of a long protracted scarcity, that patriarch, with all his family and substance, removed into Egypt, then enjoying peace and plenty under the wise administration of Joseph.

It does not appear that any great changes occurred in the interior of Canaan for some hundred years after the departure of Jacob, except that the country was frequently a prey to pestilence and famine, and was wasted by intestine broils among the petty chiefs; but its boundaries were gradually peopled by nations whose subsequent connection with the Jews requires that they should be here enumerated. On the southern border were established the Edomites, the descendants of Esau; on the south-west the Amalekites, descended either from Esau or Ham; on the south-east the Midianites and Moabites, the former descended illegitimately from Abraham, the latter from Lot; and on the east the Ammonites, also descended from Lot. A part of the east of Canaan was occupied by the Amorites, and a narrow stripe along the coast of the Mediterranean by the Philistines, both derived from Ham.

On the arrival of Jacob in Egypt, he and his family, consisting of about seventy persons, were settled in Goshen, and for many years were treated by the king and his subjects with great respect and hospitality. But by degrees the children of Israel, then called Hebrews, became so numerous as to excite the jealousy of the Egyptians; and about 1600 years A. C. they were reduced to a state of slavery, and employed in the most servile offices. At last Moses, a descendant of Levi, who had been rescued from death by the king's daughter, adopted by her, and educated in all the learning of Egypt, but had retired for some years into the land of Midian, suddenly appeared in Egypt as the asserter of the rights and liberties of his brethren, and after terrifying Pharaoh and his people with many miraculous manifestations of the divine displeasure at their oppression and detention of the Israelites, he finally effected their deliverance, and conducted them across an arm of the Red sea into the deserts of Arabia, about the year 1491, A. C. There they wandered about for forty years, miraculously supported by Providence, instructed in their religious and moral duties, and furnished with a code of ritual and ceremonial law. When they left Egypt, their numbers seem to have amounted to above a million; and though they suffered greatly in the wilderness, from pestilence and wars with the Amalekites, and one whole generation died except two persons, it does not appear that their numbers were diminished on their approach to Canaan. About 37 years after leaving Egypt the Hebrews conquered the kingdoms of Sihon and Og, two kings of the Amorites, on the east of Jordan. About 1450 years A. C. Moses died, and was succeeded as captain-general of the Israelites by Joshua the son of Nun.

He immediately made preparations for passing the Jordan and taking possession of the country to the west of that river. He was eminently successful in his military enterprizes, and, in the course of six years, subjugated nearly the whole of Canaan, and divided it by lot among the twelve tribes. The north part west of Jordan was occupied by Asher, Zebulon, and Naphthali; the south by Judah, Benjamin, Dan, and Simeon; and the middle by Issachar, Ephraim, and half of Manasseh; while the districts on the east of Jordan were possessed by the remainder of Manasseh, by Gad, and Reuben. On the death of Joshua, about 1434 A. C. the people were for some time left without a leader, and intermingled so much with the remaining Canaanites as to adopt their religion and many of their customs. They were soon involved in wars with the neighbouring nations, and successively elected generals or rulers, who were denominated judges.

The Israelites were first attacked by the Mesopotamians, and, after remaining under subjection to them for several years, were delivered by Othniel, who was appointed judge. In about 40 years after, Eglon, king of Moab, reduced them under his dominion, from which they were rescued by Ehud, after 18 years of oppression. For 80 years they remained in peace, except a slight contest with the Philistines, during which their judge, Shamgar, distinguished himself. They were next subjected to the tyranny of Jabin, king of Canaan, for 20 years; but his general Sisera, having been defeated by Barak and Deborah, they were emancipated from that slavery. The succeeding judges were, Gideon, who delivered his country from the yoke of the Midianites; Abimelech, Tola, and Jaer; Jephthah, who overcame the Ammonites; and Samson, who was at first very successful against the Philistines, but being taken prisoner, and dying in a successful effort to extirpate the lords of that nation, left his country in bondage. Eli, the high-priest, and Samuel, the prophet, were the last of the judges; and, during the administration of the latter, the form of government was changed from aristocratical to monarchical, some time between 1095 and 1065 A. C.

The first king was Saul, the son of Kish, a Benjamite, who passed a turbulent and unhappy reign, involved in continual disputes with the Philistines, and finally fell in battle. On his death, his son Ishbosheth was declared king over great part of Judæa; but David, son of Jesse, of the tribe of Judah, was invested with the regal power in the south, having rendered himself extremely popular by his military exploits in the Philistine war, and his forbearance towards Saul, who, though David was married to one of his daughters, had conceived an implacable enmity against him. But when David had reigned at Hebron for seven years, Ishbosheth abdicated his crown, and David became king over all Israel about the year 1048, A. C. He subdued both the Philistines and the Canaanites, and having taken Jerusalem, the chief city of the Jebusites, he made it the capital of his kingdom. After a glorious reign of 40 years, David left the kingdom in peace and prosperity to his son Solomon, who is renowned in Jewish history as the wisest, wealthiest, and most powerful of all their monarchs. He built the first temple for the worship of the Deity; for, till that time, all religious rites and ceremonies among the Israelites had been performed within a tent or tabernacle. He established a commercial treaty with Hiram, king of Tyre, and lived in amity with all his neighbours, during a prosperous reign of 40 years. Solomon was succeeded about the year 975, A. C. by his son Rehoboam, a rash and imprudent prince, who soon alienated the affections of the majority of his subjects, and occasioned the separation of ten tribes, leaving him the dominion only over Judah and Benjamin. From that time till the extinction of the monarchy the country was divided into the kingdoms of Israel and Judah, so that the history of each requires to be separately recounted.

Kingdom of Israel.—The ten revolted tribes chose for their first monarch Jeroboam, the son of Nebat, who began his reign about the year 975 A. C. He reigned for 17 years; and, to preserve the allegiance of his subjects, he forbade their repairing to the temple of Jerusalem to worship, and led aside the people to idolatry. Jeroboam was succeeded by his son Nadab, but he was soon dethroned and murdered by Baasha, one of his officers. The dynasty of Baasha was as unfortunate as that of Jeroboam; for his son Elah was murdered by Zimri, the captain of his host, about 930 years A. C. after he had reigned only two years. The reign of Zimri continued for only a few days; and after a contest of four years between Omri and Tibni, the candidates for the vacant throne, Omri gained the ascendancy, and established the seat of his government at Samaria. He was succeeded in the year 918, A. C. by his son Ahab, during whose reign a dreadful famine occurred in Judæa, and lasted for three years and a half. After a reign of 22 years, during which he was alternately at war and in alliance with the king of Syria, Ahab was slain near the Syrian town of Ramoth-Gilead, which he had imprudently besieged, and left the kingdom of Israel to his son Ahaziah. His reign continued for only two years; and on his accidental death, his brother Jehoram succeeded; but when he had reigned 12 years, Jehu, the son of Nimshi, one of his captains, took possession of his throne,—slew Jehoram and his mother, and put to death the worshippers of Baal. During the reign of Jehoram, the Israelites had been engaged in war with the Moabites, and overcame them. Jehu reigned for 28 years, and the regal authority continued in his family above 100 years, in the persons of his descendants, Jehoahaz, Jehoash, Jeroboam II. and Zachariah. All these reigns were more or less turbulent, either from external wars with Hazael and his successor Benhadad, kings of Syria, or from intestine commotions. For about 11 years, between the death of Jeroboam II. and the short reign of Zachariah, an interregnum occurred, and the nation was involved in anarchy and confusion. Shallum, who murdered and succeeded Zachariah, reigned but one month, when he was murdered, and succeeded by Menahem, about the year 771 A. C. During his reign of 10 years, the kingdom was invaded, devastated, and laid under tribute by Pul king of Assyria. Menahem was succeeded by his son Pekahiah, who reigned only two years, when a new dynasty was introduced in the person of Pekah, son of Remaliah, who reigned for 20 years, when he was subverted by Hoshea, son of Elah. In the reign of Pekah, Israel was again ravaged, and many of the inhabitants carried into captivity by the Assyrians. These invasions became more formidable during the reign of Hoshea, and were the means of putting a final termination to the kingdom of Israel. Hoshea was unpopular in the kingdom he had usurped, and did not fully establish his authority till after nine years; and he had not long begun to reign securely, when the Assyrian monarch, Psalmanezer, compelled him to become his tributary. For some time Hoshea paid the tribute regularly; but at last he endeavoured to throw off the yoke, and strengthen himself by an alliance with the king of Egypt. When Psalmanezer discovered this defection, he invaded Israel with a large army,—demolished Samaria the capital,—made Hoshea and his subjects prisoners, and dispersed the latter among the cities of Media, sending a colony of his own subjects to supply their place. This event took place about the year 720 A. C. and thus originated the people who, for many hundred years after, were denominated Samaritans.

Kingdom of Judah.—The rebellion of the 10 tribes rendered Rehoboam rather more prudent in the management of his remaining territory. During his reign the kingdom was invaded, and Jerusalem pillaged, by the Egyptians. He occupied the throne for 17 years, and was succeeded by his son Abijam. He engaged in a war with the Israelites, and took Bethel and some other places. After a prosperous reign of three years, he was succeeded by Asa, who reigned for 41 years, and was very successful in his wars with the neighbouring nations, especially the Ethiopians. His son Jehoshaphat began his reign 914 years A. C. He was a well meaning but weak prince, and entered into an imprudent alliance with Ahab, king of Israel, whom he accompanied to Ramoth-Gilead, and nearly lost his life in the battle which proved fatal to his ally. He also assisted Ahab's son, Jehoram, against the Moabites, and some time before his death, in 889 A. C. associated his son, also named Jehoram, in his kingdom. After a turbulent reign as sole monarch of about four years, during which he was involved in continual disputes with the surrounding nations, Jehoram was succeeded by his son Ahaziah, who reigned only one year, having been put to death by Jehu, when on a visit to Jehoram king of Israel. On the death of Ahaziah, his mother Athaliah became queen regent, and held that office six years. She endeavoured to extirpate the house of David; but Joash, a younger son of Ahaziah, escaped, and was proclaimed king of Judah, about 878 A. C. He reigned for 40 years, repaired the temple of Jerusalem, was attacked near the close of his reign by the Syrians, and was assassinated by his servants; but no change of dynasty took place. His son Amaziah being seated on the throne, engaged in a war with the king of Israel, but was unsuccessful, taken prisoner, and finally murdered by his subjects after an inglorious reign of about 28 years. His son and successor Uzziah, otherwise called Azariah, enjoyed a prosperous reign of 52 years; he subdued several of the lesser nations, which were usually tributaries of Judah; but near the conclusion of his reign, becoming leprous, he was, according to the Jewish law, disqualified from exercising the regal power, and his son Jotham was appointed regent. During the reign of Uzziah a dreadful earthquake occurred in Judæa. Jotham reigned prosperously for 16 years, beloved by his subjects, and dreaded by his neighbours, whom he kept in subjection, and was succeeded by his son Ahaz. The reign of Ahaz equalled in length that of his father, but was turbulent and unhappy. His subjects suffered much from the inroads of the Syrians, and many of them were carried into captivity to Damascus. They were also attacked by Pekah, king of Israel, and 140,000 were slain in one day. About 726 years A. C., Hezekiah, son of Ahaz, who had already shared the kingdom with his father for one year, became sole king of Judah. He was soon engaged in disputes with the Philistines and Assyrians. The former he subdued, but the latter power began even then to be very formidable to Judah as well as Israel. The armies of Sennacherib ravaged the whole country, and took almost all the towns except Jerusalem, to which they also laid siege for a short time.

Hezekiah was succeeded by his son Manasseh about the year 698 A. C., who reigned in peace for 22 years, when his kingdom was invaded by Esarhaddon King of Assyria, to whom Israel was then subject. Manasseh was taken prisoner and carried to Babylon with many of his subjects, but was afterwards restored to his kingdom, probably as a tributary to Assyria. Manasseh reigned altogether 55 years, and was succeeded by his son Amon, who reigned only two years. He was murdered by his servants, but Josiah his son was appointed king in his room, and was the last monarch of Judah that enjoyed any degree of prosperity or independence. He reigned for 31 years, and fell in battle with

Pharaoh Necho king of Egypt. He was succeeded by Jehoiahaz his son, who had reigned only three months when he was carried into captivity by the king of Egypt, and his brother Jehoiachim was appointed in his room. In the third year of his reign, Judah was invaded by the Chaldeans under Nebuchadnezzar, and many of the inhabitants were carried captive to Babylon. In the 11th year of his reign, as he had rebelled against Nebuchadnezzar then king of Babylon, his kingdom was invaded by the Chaldeans and he himself put to death. His son Jehoiachin was suffered to reign about three months when he was taken to Babylon, and his brother Zedekiah made king, under the condition that he should pay an annual tribute to the king of Babylon. But he very soon rebelled, and sought protection from the Egyptians. To punish his ingratitude, Nebuchadnezzar sent a powerful army into Judæa, attacked Jerusalem, and, after a siege of two years, took and burnt the city, pillaged and destroyed the temple, and carried the principal inhabitants to Babylon. Thus, about 588 A. C., a period was put to the kingdom of Judah, and the Jewish monarchy was finally overthrown, after it had continued about 500 years.

It appears, from the above brief account, that while continual changes occurred in the dynasties of the kingdom of Israel, where no family reigned longer than a 100 years, the sceptre of Judah, from the death of Saul to the dethronement of Zedekiah, continued in the hands of the lineage of David.

Many eminent persons were among the captives transported to Babylon, especially Daniel and Ezekiel the prophets, the former of whom enjoyed an office of trust and consideration at the court of several succeeding princes, and Mordecai, the uncle of Esther. The Jews were distributed among the principal cities of the Chaldean empire, especially in Media, but a miserable remnant was left to waste their lives in penury and bondage in Judæa. On the death of Nebuchadnezzar, about the year 561 A. C., his son, Evil-Merodach behaved towards the Jewish king, Jehoiakim, with great respect, and, in some measure, relaxed the severity with which the Jews had been hitherto treated; and when the city of Babylon was taken by the Medes and Persians under Darius, some of the leading men of that nation were advanced to places of dignity in the new empire. At last, on the establishment of the Persian monarchy by Cyrus, the affairs of the Jews began to assume a more favourable aspect. A considerable body of them, under Zerubbabel, prince of Judah, were permitted to return to Jerusalem and to rebuild the temple. They began to lay the foundations of this second temple about 535 A. C., but, from the jealousy of the Samaritans, the building was often interrupted. About 70 years after the subversion of the monarchy, the new temple was completed; but the walls of the city remained in a ruinous state till the reign of Artaxerxes, when first Ezra the chief priest, and afterwards Nehemiah, were dispatched into Judæa to forward the building of the city and re-establish the tranquillity and laws of the Jewish nation. After many disputes with their Samaritan neighbours, the Jews became settled about the year 440 A. C.; beyond which period, till the commencement of the Christian era, their history is not narrated by any acknowledged inspired writer.

During their exile from their native country, the Jews suffered many hardships and much oppression. Many attempts were made to induce them to change their religion for the idolatrous worship of their conquerors; and during the reign of one of the Persian monarchs, called in scripture Ahasuerus, supposed by different writers to be the Darius Hystaspes, Xerxes, or Artaxerxes Longimanus of profane history, they were near being exterminated by a general massacre, but were saved by the influence of Queen Esther with the king, her husband. In the meantime, the new inhabitants of Judæa, or the Samaritans, though they continued pagans, seemed to have adopted many of the laws and religious observances of their predecessors, and in time began to consider themselves as the legitimate descendants of Abraham, and on an equal footing with their Jewish neighbours. About the year 408, this people prevailed on their governor, Sanballad, to allow them to erect a temple on mount Gerizzim, in opposition to the temple of Jerusalem; and Manasseh, a Levite who had married Sanballad's daughter, was appointed first high-priest of the Samaritans.

Soon after the events which have now been recorded, Judæa was wrested from the dominion of the Persians by the kings of Syria, and became a province of that monarchy. Under the Syrian governors, the high-priests at Jerusalem exercised the chief authority both in civil and religious matters for above 300 years. One of the first of these high-priests was Jonathan the son of Joiada, between whom and his brother Joshua, who attempted to supersede him under the patronage of the governor Ragoses, arose a contention which terminated in the death of Joshua. In the year 332 A. C. Alexander the Great, who had subdued Persia and taken the cities of Tyre and Sidon, advanced into Judæa to punish the Jews for their adherence to his enemies; but being met without the walls of Jerusalem by Jaddua the high-priest, at the head of a numerous procession of the priests and people clothed in white, the conqueror was so much struck with the spectacle, that he abandoned all thoughts of vengeance, accompanied the high-priest to the Holy City, and paid a visit to the temple. After the death of Alexander, and the partition of his dominions among his four principal generals, Judæa became exposed to the alternate ravages of the kings of Egypt and Syria, between whom an almost continual warfare was carried on for above 150 years. About the year 320 A. C. during the priesthood of Eleazar, grandson of Jaddua, Ptolemy Soter, king of Egypt, invested Jerusalem and carried it by assault, or, as Josephus says, by stratagem, on a Sabbath-day, when the Jews thought it unlawful to defend themselves. By this conquest he rendered himself master of Judæa; but though he imposed on the Jews an annual tribute, he treated them with great lenity, and advanced many of the most distinguished persons to places of trust in his dominions. His successor, Ptolemy Philadelphus, pursued the same system of lenient policy, and employed seventy-two Jews, most learned in their law and eminently skilled in the Greek language, to translate the Jewish Scriptures into that tongue, for the use of his library at Alexandria. About the year 215, A.C. Ptolemy Euergetes, son and successor of Ptolemy Philadelphus, in his way through Judæa from an expedition against the Syrians, paid a visit to Jerusalem, and offered sacrifices in the temple. Twelve years after, in consequence of the dilatoriness of the Jews to pay the usual tribute, the same Ptolemy threatened to invade the country, but was reconciled through the prudence of Joseph, nephew of the high priest Onias. In the war which arose about that time between Ptolemy Epiphanes and Antiochus the Great, about 200 years A. C., Jerusalem submitted to the latter, who consequently became for some time master of Judæa; but having formed an alliance with Ptolemy, he soon after gave up his claim in favour of that prince. About the year 176 A. C., Seleucus, the successor of Antiochus, attempted to plunder the temple of Jerusalem, but was diverted from his design by the representations of Heliodorus, whom he had sent for that purpose. On the death of Seleucus in the following year, his brother, Antiochus Epiphanes, became master of Judæa, and during his reign the Jews suffered much tyranny and oppression, but behaved so bravely as eventually to free themselves from the Syrian yoke. Antiochus began with appointing Jason high priest, and imposing a heavy tribute on the Jews. Learning that a report of his death which had reached Jerusalem had occasioned great rejoicing among the Jews, Antiochus hurried from Egypt, attacked and took Jerusalem, and abandoned it for three days to the pillage of his soldiers in the year 170, A. C. On this occasion 40,000 of the inhabitants were slaughtered, and the utmost cruelty exercised towards the rest. Two years after he was induced to relax in his severity by the interposition of the Romans, but soon began to resume his former tyranny. About 166 A. C. he built a strong fort opposite the temple, and published a decree compelling all his subjects to profess the same religion, and worship the heathen gods. The Samaritans, among other people, acquiesced in his demands, but the Jews boldly refused to abandon their religion, and great numbers of them fell by the hands of the executioner.

At last Judas Maccabeus, son of Mattathias, being appointed general of the Jewish nation, determined to resist the tyranny of Antiochus. He first attacked the Syrian governor Apollonius, and defeated him with great slaughter; and in another engagement with Antiochus' general, he was equally successful, both the Syrian commanders being slain in battle. Exasperated at these defeats, Antiochus resolved to take signal vengeance on the rebellious Jews. He sent into Judæa an army composed of 40,000 foot and 7,000 horse, accompanied by about a thousand merchants who were to purchase those Jews that were expected to fall into the hands of the Syrians; but Judas, with only about 3000 men, attacked the formidable force in two successive engagements, in both of which he was victorious, and slew above 9000 of the enemy. A new army, composed of 60,000 foot and 5000 horse, all chosen troops, under the command of Lysias, an experienced general, soon after encamped at Bethsura, a town to the south of Jerusalem; but before they had time to march against Judas, they were attacked by that general with only 10,000 troops, and, after losing 5000 men, retreated to Antioch. After this decisive victory, Judas marched to Jerusalem, took and purified the temple, and instituted the *feast of dedication*, which was observed by the Jews for above 200 years. This memorable event took place about 164 years A. C.; and during the remainder of Antiochus' life, Judas gained several victories over the Syrians, and overcame the Idumeans, Ammonites, and some other neighbouring states who had invaded Judæa. On the death of Antiochus Epiphanes, his son Antiochus Eupater for some time carried on the war with the Jews, and sent an army of above 80,000 men, with 80 elephants, to attack Judas. This expedition also proved unsuccessful. Above 12,000 of the Syrians fell in the battle, and Antiochus consented to an honourable peace. But hostilities were soon recommenced, and Judas again repeatedly defeated large armies of the Syrians, and slaughtered many thousands. In one of these engagements, in a narrow pass of the mountains, Eleazar, one of the brothers of Judas, particularly distinguished himself by stabbing an elephant richly caparisoned, which he supposed to bear the royal tower; but being unable to make his escape in time, he was crushed to death by the fall of the unwieldy animal. Demetrius Soter who ascended the throne of Syria on the death of Antiochus, continued the war with the Jews with various success, and Judas, finding himself unable to contend with such a powerful enemy, resolved to form an alliance with the Romans; but before the treaty could be concluded, he was defeated, and put to death about the year 161 A. C. Judas was succeeded as general of the Jews by his brother Jonathan, who also contended so successfully with the Syrians as to obtain a cessation of hostilities for about two years, and finally to conclude an honourable peace in the year 158 A. C. During the competition which took place about that time between Demetrius and Alexander Bala, and which ended in the elevation of the latter to the throne of Syria, Jonathan Maccabeus took part with the usurper, and under his sanction assumed the office of high-priest and chief ruler of the state, and that twofold dignity continued to be enjoyed by his posterity for several successive generations. He soon after repented of his alliance with Alexander, and sided with Demetrius, son of the preceding monarch of that name, till, roused by the tyranny exercised by the new king, he again embraced the cause of Antiochus, the son of Alexander. About the year 155, A. C., he was treacherously entrapped by Typhon, who, under the mask of friendship for Antiochus, was aiming at the throne of Syria, and was soon after murdered. Jonathan was succeeded by his brother Simon, who, after a respectable reign of eight years, was assassinated by Ptolemy his son-in-law.

His son John, surnamed Hyrcanus, was appointed in his room, and after sustaining a long siege in Jerusalem, was compelled to make peace with the Syrian king, on condition of paying an annual tribute, and suffering the walls of Jerusalem to be demolished, and its inhabitants disarmed. But, on the death of Antiochus, and the subsequent disturbances in Syria, Hyrcanus threw off the yoke, and rendered his country independent. He formed an alliance with the Romans, and was very successful in a war with the Idumeans, whom he completely subjugated. He also besieged and took Samaria, and acquired a more extensive dominion than had been possessed by any Jewish prince since the time of Solomon, as his territories comprehended Judæa Proper, Samaria, Galilee, and part of Idumea. During his reign the two religious sects called Pharisees and Sadducees began to rise into consideration, and to form conspicuous parties in the state. Hyrcanus had been bred a Pharisee, and at first favoured that sect, but during the latter part of his reign he patronized the Sadducees. He died about 105 A. C. after having governed the Jews 29 years. He was succeeded by his son Aristobulus, who for the first time since the Babylonish captivity took the title of king. He was cruel and tyrannical, murdered his brother and mother, and died miserably after a short reign of one year. Alexander Jansens, a younger son of Hyrcanus, was now placed upon the throne of Judæa, and passed a turbulent reign of 27 years, continually embroiled with his subjects, from the contentions between the Pharisees and Sadducees, whom in vain he attempted to reconcile; but he maintained his authority, and left his kingdom unimpaired to his wife Alexandra. She appointed her son Hyrcanus high-priest, and after reigning for nine years left him the crown. But her younger son Aristobulus, an ambitious prince, soon contrived to supersede him, and Hyrcanus retired to Arabia and afterwards to Babylon. Hyrcanus found means to ingratiate himself with the Roman general Pompey, who was then disputing the management of the Roman republic with Julius Cæsar. Pompey was then engaged in an expedition against the Parthians, and on his return in the year 63 A. C. he passed through Judæa, took possession of Jerusalem, and carried Aristobulus prisoner to Rome. It is remarkable that the capture of Jerusalem by Pompey happened on the very day which the Jews held as a solemn fast for the taking of the city from the Babylonians nearly 600 years before. About that time Antipater, an Idumean, who had acted under Hyrcanus as governor of his native country, then a province of Judæa, began to exert his ambitious views in favour of his sons Phasael and Herod, and obtained for the former the situation of governor of Judæa, with the command of Jerusalem, and for the latter the government of Galilee. Pompey, though he had entered the temple, abstained from possessing himself of the treasures it contained; but Crassus, another member of the first Roman triumvirate, in a similar expedition against the Parthians, went to Jerusalem, and plundered the sacred edifice of treasure to a vast amount.

After the deaths of Pompey and Julius Cæsar, Antigonus, son of Aristobulus, was made king of Judæa by the Romans about the year 40 A. C.; but Herod having brought over Mark Antony to his interest, soon procured his dethronement, and became king of all Judæa. He was a cruel and capricious tyrant, and was never able to reconcile the Jews to his usurpation, though he behaved very generously during a dreadful scarcity in Judæa, maintained the dignity of the kingdom, and built a most splendid and magnificent temple. In this work he employed 10,000 artificers and labourers, and 1000 waggons, for two years, in collecting and preparing materials, especially in transporting immense stones, which were so exactly finished, that when joined together the building appeared like one solid and uniform mass. About 12 years were employed in completing the principal part of this third temple, the wonder and admiration of the succeeding age; but as additions or alterations were continually made, it was not entirely finished for above 40 years. The cruelties of Herod occasioned several conspiracies against him, but the conspirators were discovered and put to death, and many innocent persons also fell victims to the suspicions of the king. Among them were his uncle Joseph, Hyrcanus the late high-priest, Mariamne his second wife, Alexandra her mother, and Alexander and Aristobulus her two sons by Herod. About the latter end of this reign, according to most chronologists, about the year of the world 4004, Jesus Christ was born, and soon after carried into Egypt to escape the malice of Herod, who, conceiving the Messiah would be a temporal prince who might dispossess him of his kingdom, endeavoured to take effectual means to prevent such a revolution, by causing all the male children in and about Bethlehem, within two years of age, to be butchered. Herod died of an incurable disease at Jericho, some time before the sixth year of the Christian era. On his death his dominions were divided among his three sons,—Archelaus, who possessed Judæa, Idumæa, and Samaria, with the title of king; Herod Antipas, who became tetrarch of Galilee; and Philip, also sometimes called Herod, tetrarch of Decapolis and the confines of Jordan.

The reign of Archelaus proved very turbulent. Conspiracies and petty rebellions continually arose, and required much prudence, as well as courage, to extinguish; but Archelaus possessed little of the former, and treated his subjects with such severity that they complained to Augustus the Roman emperor. He sustained the appeal,—deposed Archelaus in the tenth year of his reign, and reduced his dominions to the form of a Roman province. The other two brothers continued in the quiet possession of their respective territories till their death. Of these princes, Herod Antipas resembled his father in his disposition and vices. Under the Roman emperors, Judæa was regarded as a province subordinate to that of Syria, though it was under the immediate direction of governors sent from Rome. The most eminent of them was Pontius Pilate, during whose government of ten years Jesus Christ began and finished his ministry, and the Christian religion made considerable progress. On the death of Herod Antipas, the tetrarchate of Galilee, and afterwards the whole of Judæa, were transferred to Herod Agrippa, grandson of Herod the Great, who died miserably at Cæsarea about the year 44. Soon after the accession of the emperor Caligula, Pilate was removed from the government of Judæa, which, after having been erected into a kingdom under Herod Agrippa, was soon reduced once more to a province of Rome, though Agrippa, the son of the last Herod, enjoyed the titular appellation of king.

About the year 48 or 50 began those disturbances and disputes between the Jews and the Romans, which led to the destruction of Jerusalem, and the final dispersion of the Jewish people. Ventidius Cumanus was then the ninth Roman governor, and, according to the example of his predecessors, had appointed soldiers to guard the porticos of the temple, in order to prevent those disorders which frequently occurred among the Jews. On the fourth day of the feast of the passover, a dispute arose between the soldiers and the people, and occasioned some bloodshed. Soon after a fresh tumult broke out between some Galileans who were repairing to Jerusalem, and the Samaritans, owing to the insults of the latter; and as Cumanus took part with the aggressors, he was sent to Rome by the governor of Syria, and the emperor Claudius appointed Felix in his room. At that time Judæa was exceedingly populous, and Jerusalem alone is supposed to have contained above 2,000,000 of inhabitants, though it is probable that in this computation the Jews who resorted thither at the great festivals are included. During the government of Felix several insurrections took place, and occasioned the governor to exercise much cruelty and severity. Felix was succeeded by Portius Festus about the year 60, and on his death in 62 Albinus was appointed governor. At the commencement of his authority the inhabitants of Jerusalem were alarmed, during the feast of tabernacles, by a remarkable circumstance, which was regarded as a presage of their impending ruin. An unfortunate maniac, named Jesus, almost continually went about the city, uttering exclamations, and denouncing woes against Jerusalem, the temple, and the Jewish nation, which were deemed, and indeed proved prophetic. He persisted in this practice, though severely chastised, for about seven years, when at the commencement of the siege he was killed by a stone at the moment he was exclaiming "Woe to myself!" Florus, the successor of Albinus, who was appointed governor in 64, contributed, by his severity and rapacity, to keep alive the seditious spirit of the Jews. In the second year of his government, the inhabitants of Jerusalem rose in considerable force, attacked the Roman garrison, burnt the building which contained the public records, took the castle of Antonia, and put most of the Romans to the sword. Florus seems to have foreseen that a rising would take place at that time; for, on the same day, by his orders, the Jews of Cæsarea were attacked, and 20,000 of them were murdered. About the same time an insurrection took place at Alexandria in Egypt, which was inhabited partly by Jews, and there 50,000 of that people fell by the hands of the Roman soldiers.

This general revolt of the Jews commenced in the 12th year of the reign of Nero, and while Agrippa was still titular king of Judæa. Cestius Gallus, then governor of Syria, on receiving intelligence of the tumults at Jerusalem and Cæsarea, marched with a numerous army to attack the rebels; but when he arrived at Gibeon, about six miles from Jerusalem, he was encountered by a large body of Jews, and with some difficulty maintained his ground, and compelled the insurgents to retreat to Jerusalem. He pursued them closely, and entered the city, but soon left it without any apparent cause. This retreat emboldened the Jews to make a sortie and attack Gallus, whom they defeated with the loss of 6,000 men. The insurgents then prepared for a vigorous defence, repaired and strengthened the walls of Jerusalem, and appointed Joseph, the son of Gorion, and Annanus the high-priest, joint governors of the city. Josephus, the Jewish historian, was also sent into Galilee, where he raised a body of 60,000 men in defence of his country. The ill success of Gallus occasioned his recal, and Nero appointed Vespasian governor of Judæa, and commander of the Roman forces. He immediately set out for Asia, landed at Antioch in Syria, and proceeded to Ptolemais, and being there joined by his son Titus found himself at the head of 60,000 men. With this force, in the year 67, he advanced into Galilee to attack Josephus, who, being abandoned by most of his troops, retired to Tiberias. Vespasian having taken possession of some towns in Galilee, marched to Jotapata, where Josephus determined to make a stand. The Romans invested the town, but the inhabitants defended themselves valiantly, and made several successful sallies. At last, having discovered that the besieged were in very great want of water, and having effected a breach with his battering engines, Vespasian carried the place by assault, and put most of the inhabitants to the sword. Josephus made his escape, and, after remaining concealed for some days in a cave, was prevailed on to surrender himself to the Romans, and during the remainder of the war endeavoured to act as mediator between them and his countrymen. Vespasian took Joppa, Tiberias, Tarichea, Gamala, and Giscala, and was preparing to proceed towards Jerusalem, when he received intelligence of his having been elected emperor of Rome. He appointed Titus general of the army of Judæa, with discretionary powers to act as occasion should require.

The conquest of the Jews would have been a difficult task even to such an experienced general as Titus, but for the dissentions by which that people were prevented from acting in concert against the common enemy. Three factions, hostile to one another, then divided the Jewish nation; the zealots, headed by John of Giscala,—a numerous band of robbers and murderers, under Simon, son of Gioras,—and a third party, consisting chiefly of the inhabitants of Jerusalem, under the command of Eleazar. In the year 70, Titus, attended by Agrippa and Josephus, advanced towards Jerusalem. The feast of the passover, held in the month of April, had just commenced, and the city was unusually thronged with inhabitants and strangers. At first the three factions agreed to unite their forces in opposition to the Romans,—sallied out with great fury and resolution, and compelled the enemy to abandon their camp and retire towards the mountains; but Titus quickly rallied his troops, and drove back the Jews within the walls. On the first day of the passover, immediately after the successful sally, an affray arose between the zealots and the followers of Eleazar, in which the latter was slain. Availing himself of these dissensions, Titus advanced to the outer wall of the city, part of which he battered down, so that he possessed himself of the north quarter. He endeavoured to persuade the Jews to surrender without farther injury; but finding them resolved to make a desperate resistance, he proceeded to batter the second of the three walls with which Jerusalem was then environed. Having penetrated this barrier, and thus become master of the lower city, he paused, in hopes of saving the city and temple from utter destruction, and sent a parley to the inhabitants by Josephus. But the address of that distinguished patriot, though it persuaded many of the citizens to quit the place, had little effect on the great body of the Jews. They were at that time labouring under a great scarcity of provisions, and the stronger party exercised the greatest cruelty towards the weaker, to compel them to surrender the very means of their existence. Titus was well apprised of these calamities, and, though he would willingly have received the submission of the inhabitants, determined to punish their obstinacy. He intercepted parties who came out to forage, and, by way of intimidating the rest, ordered the prisoners to be crucified. According to Josephus, these victims were so numerous, that crosses were wanting for the execution, and room for fixing them had they been supplied. To prevent all possibility of the besieged receiving succour from without, Titus employed his whole army in constructing a rampart all round the city, a work which was completed in three days. Thus, shut out from every relief, the wretched inhabitants of Jerusalem perished by thousands in a day from famine and pestilence, so that nearly a million of persons died before the city was taken, and the surrounding ravines were filled with their dead bodies. Early in July, Titus forced the inner wall, and compelled the remaining inhabitants to take refuge in the temple, which he immediately invested; and in August this magnificent edifice was taken and burned to the ground. Many thousands of Jews perished in it by famine, fire, or the sword of the enemy, and vast treasures fell into the hands of the victors. The leaders of the factions, with a few followers, retreated to mount Zion, where they made their last desperate stand, thus disputing every inch of ground, and maintaining an obstinate but hopeless resistance. They held out till September, and might have resisted much longer, had they not, by a wonderful infatuation, abandoned a fortress which appeared impregnable, and hid themselves in holes and caverns, whence they were dragged and put to the sword. Thus, after a siege of five months, Jerusalem was taken and so utterly destroyed, that scarcely one stone was left upon another. It is computed that not fewer than 1,000,000 perished during that memorable siege, and that more than 250,000 Jews were slaughtered about the same time in other parts of Judæa. Nearly 100,000 were made prisoners, and either sold as slaves or conveyed to Rome to grace the triumph of the conqueror.

The taking of Jerusalem was speedily followed by the reduction of the whole of Judæa and the dispersion of most of its inhabitants through almost every part of the Roman empire; and from that time the existence of the Jews as a nation is no longer recognized in history. Of the more important events that have since occurred in the Holy Land, a very brief outline will be sufficient.

The Roman emperor Adrian built a city near the site of Jerusalem, which he called Ælia; and, during his reign, another bloody war took place between the Romans and the inhabitants of Judæa, and the new city was taken and destroyed. But it was soon rebuilt by Adrian, and all Jews forbidden on pain of death to enter it. The city was generally called Ælia till the reign of Constantine, when it resumed, or rather acquired, the appellation of Jerusalem. Several disturbances happened in Judæa under the emperors Antoninus, Severus, and Caracalla. Constantine, in a progress through his Syrian dominions, visited Jerusalem, enlarged and beautified the city, and erected in it several Christian churches and other handsome buildings. His mother, Hellena, made a pilgrimage to the Holy Land, and built, in Jerusalem and other towns in Judæa, many of those edifices which have been already mentioned. The emperor Julian, who had apostatized from the Christian religion, was very favourable to the Jews, and formed the resolution of reassembling them from all parts of his empire, and reinstating them in Jerusalem. He even made preparations for rebuilding the temple; but that undertaking was frustrated by a phenomenon which terrified the workmen and compelled them to desist. His successor, Jovian, recalled the edicts of his predecessor, and treated the Jews with great severity. During the reign of Justinian, at the commencement of the sixth century, the inhabitants of Judæa, among whom a great many Jews still remained, attempted to revolt from the Romans, but were speedily subdued. That emperor established at Jerusalem a Christian bishop under the title of Patriarch. Early in the seventh century, when Heraclius was emperor of the East, Judæa was invaded by Cosroes king of Persia, who was hailed by the Jews as a deliverer. In 613, he took and pillaged Jerusalem, sold 30,000 Christians to the Jews, by whom they were put to death, and continued the war till 627, when he was defeated and driven from the Holy Land by Heraclius. About nine years after, the calif Omar, then at the head of the Mahommedans, entered Judæa, and carried his victorious arms to the gates of Jerusalem, which, after a siege of four months, surrendered by capitulation in 637; and thus the Holy Land was transferred from the Greek to the Mohammedan empire, to which it continued subject for about 400 years, except that, during that time, it twice fell under the dominion of the sultans of Egypt. In the beginning of the eleventh century, Judæa became subject to the Selzuccian Turks, but again, in 1076, reverted to the sultan of Egypt.

In 1099, Godfrey of Boulogne, leader of the first Crusade, landed in Palestine, and after taking possession of Rama, Emmaus, and Bethlehem, laid siege to Jerusalem, which was taken in July of that year.

Godfrey was elected king of Jerusalem, a kingdom which proved something more than titular, as it was soon extended by the capture of Napolose, Jaffa, and Ascalon, at which last place the army of the Egyptians was defeated by the Crusaders. Godfrey was succeeded by Baldwin, count of Edessa, and on his death, in 1118, Baldwin de Bourg was raised to the throne. During a period of 80 years, the Christian kingdom of Jerusalem subsisted, and six other chiefs reigned in succession; but in 1187, Saladin, who had conquered the califs of Bagdad, and had rendered himself master of Syria and Egypt, invaded the Holy Land, and after a siege of fourteen days took Jerusalem, and expelled the Franks, but suffered the Greek Christians to remain in possession of what was called the Holy Sepulchre. It is said that Saladin would not enter the mosque of Omar, which had been converted to a Christian church, till he had every part of the building washed with rose-water. Soon after this success of Saladin, Richard I. of England arrived in Palestine and took possession of Ptolemais, but though he received the empty title of King of Jerusalem, he made little progress in the conquest of Palestine. After Richard's departure, Jerusalem and most of Judæa became subject to Al Moadham, nephew of Saladin, and sultan of Damascus, who demolished the walls of the Holy City; but about the year 1228, Al Khamel, sultan of Egypt, who had succeeded to the dominions of Al Moadham, consented to deliver up Jerusalem to the emperor Frederic II., on condition that the walls should not be rebuilt, and that the mosques should be reserved for the devotions of the Moslems. Frederic was crowned king of Jerusalem, but soon returned to Europe; and about 20 years after his departure, the Christians being accused of violating the compact, Melacselah or Medjmeddin, sultan of Egypt, took and pillaged Jerusalem and spoiled the Holy Sepulchre. Soon after, the Mamelucs became masters of Egypt, exterminated the race of Saladin, and finally expelled the crusaders from Judæa in 1291. The Holy Land remained subject to the Mameluc sultans of Egypt till 1382, when they were dispossessed by the Circassians, but it returned to the dominion of the Egyptian Mamelucs till the time of Tamerlane khan of the Mogul Tartars. At his death it again reverted to the sultans of Egypt till 1516, when Selim IX. emperor of the Othman Turks, having subdued Egypt and Syria, became possessed of the Holy Land, which his descendants have ever since retained.

Dispersed Jews.—The history of the Jews who have been dispersed among other nations is not less interesting than that of the Holy Land since the fall of Jerusalem. In relating the principal events that have befallen them, it will be convenient to mention those of each century; and the state of the Jews in England, as best known, will be more particularly noticed.

Eighth century.—Though it be probable that many Jews had arrived in Britain during the continuance of the Roman power in this island, no certain account is given of them previous to the eighth century, when they must have been pretty numerous in England; for in a charter of Witglaff, king of Murcia, to the monastery of Croyland, all grants made to them either by Christians or *Jews* were confirmed; and in 740 an order was issued by the Archbishop of York, forbidding the Christians of his diocese to be present at the Jewish feasts.

During the *ninth* and *tenth* centuries the Jews rose into estimation in most parts of Europe, especially in England, Italy, and Germany, as merchants, bankers, and jewellers. They were the chief agents in commercial transactions, and almost the only persons capable of lending money either to individuals or to the state.

In the *eleventh* century they were favoured in England by William Rufus, who encouraged them to dispute with the dignitaries of the church on the comparative merits and divine origin of the Jewish and Christian religions, declaring, that if the Jews proved victorious he would embrace their faith. Accordingly, a solemn disputation was held, and the Jews showed so much boldness and ingenuity that the bishops were seriously alarmed for the result.

Twelfth century.—Henry II. granted the Jews of England several privileges, particularly the property of certain spots without the principal towns for burying their dead. They were at that time so wealthy, that one Jew supplied large sums to the Irish chiefs in their wars with the English; and in 1188 it was proposed, by the parliament held at Northampton, to assess them to the amount of L.60,000, while the rest of the nation were to furnish only L.70,000. Richard I. treated them with great severity, and not only exacted from them large sums of money, but encouraged his subjects to exercise towards them many indignities, to maltreat their persons, and plunder them of their wealth. So great was the persecution raised against them, that most of the rich Jews left the kingdom, and their retreat occasioned much inconvenience and embarrassment among the commercial part of the nation. John, finding it extremely difficult to raise money for his extravagancies and projects without the Jews, used all his endeavours to recal them, and in a great measure succeeded; but no sooner were they within his power, than they were again persecuted and plundered both by king and nobles.

In the *thirteenth* century the Jews were very numerous in most parts of Europe, particularly in Poland, Germany, England, France, and Spain. They had synagogues in at least 13 different German towns. A Spanish Jew, called Benjamin of Todela, who during that century travelled into various countries for the purpose of ascertaining the numbers of his brethren, found that, exclusive of London and Paris, there then existed in Europe, Asia, and Africa about 770,000 male Jews. It is computed, that the whole number of that people could not then be less than 4,000,000. In England the persecution of the Jews still continued, though they were in some degree protected by Henry III., who, to distinguish them from the rest of the nation, ordered that they should wear two broad stripes of white linen or parchment on the fore part of their upper garment. But for his interference, many of that wretched people would have been starved, for the archbishop of Canterbury, and the bishops of Lincoln and

Judæa.

Ives ‖ Ivica.

Norwich, threatened all persons within their dioceses with excommunication if they held any intercourse with Jews, or even sold them the necessaries of life. In 1230 they were permitted to erect their first synagogue in London; but the building was so costly and magnificent as to excite the jealousy of the citizens, and Henry was prevailed on to deprive them of the building and have it consecrated as a Christian church. Four years after, on receiving a petition from the inhabitants of Newcastle against the Jews, he granted the former the singular privilege that no Jews should be allowed to reside in that town. During the disputes between Henry and the English barons, the latter, to ingratiate themselves with the people, raised against the Jews a tumult, in which 700 of that people were slaughtered, and their houses plundered and destroyed. It appears that they contrived, about the year 1270, to erect a new synagogue, of which they were deprived on a complaint of the Friars Penitent that they could not *make the body of Christ* in quiet, owing to the *howlings* of the Jews during their worship. Edward I. passed a law in favour of the Jews; but in the 18th year of his reign, after seizing on all their landed property, and thus reducing many thousands of innocent persons almost to a state of beggary, expelled all the Jews from his dominions.

In the 14*th century* the Jews of Poland received many privileges from Cassimir the Great, who is said to have been extremely fond of a Jewish woman named Esther, though it is probable that he found his account in patronising a people so numerous and so wealthy. In the 15*th* century, the Jews, who had been pretty numerous in Spain ever since the invasion of the Moors, were expelled from that kingdom by Ferdinand and Isabella, and appeared to have retired chiefly to Barbary, Smyrna, and Constantinople, where many of the Jews still speak a corrupted Spanish dialect. Towards the end of the 16*th* century the Italian Jews, who had been partly tolerated but more frequently persecuted, but whose cause had been ably advocated by some members of the club of Vicenza, were deprived of this patronage by the suppression of that society from the interference of the inquisition.

Seventeenth century.—From the expulsion of the Jews out of England by Edward I. till the usurpation of Oliver Cromwell, only a few stragglers of that people were found in Britain; but when Cromwell had established his authority, he sent into Holland an invitation to the Jews of that country to repair to England on a promise of his protection. Many accepted the invitation; and since that period, though occasionally persecuted as individuals, they have formed a constant and respectable part of the community. Their numbers increased considerably during the reign of Charles II. and in 1684 James II. lessened, in favour of the Jews, the duties on goods exported by aliens. William III. caused the act of his predecessor to be repealed. At the commencement of Queen Anne's reign, an act of parliament was passed for encouraging the conversion of Jewish children to the Christian religion, by declaring such converts independent of their parents.

Eighteenth century.—Early in the reign of George II. a proposal was made in London to introduce an act of parliament for the suppression of Jew brokers, but the measure met with so little encouragement that it was abandoned. In 1753, an act was passed for relieving the Jews from the alien-laws, and enabling them to be naturalized without the usual condition of taking the sacrament of the Lord's supper; but the act proved so unpopular that it was soon after repealed. In the 10th year of the reign of George III. any Jews cited to appears in courts of justice, or called upon to take the oath of abjuration, were allowed to omit such clauses in the usual forms as were inconsistent with their peculiar tenets, and ever since they are sworn on such occasions according to their own rites. In the latter end of this century, the interests of the Jews were considerably promoted in France, in consequence of a prize-essay, written by a Polish Jew, in answer to a question respecting the means of rendering the French Jews happier and more useful,—proposed by the academy of Metz.

Nineteenth century.—In the year 1806, Bonaparte issued a decree, appointing an assembly of deputies from the Jews of France and Italy to meet at Paris in July; and on their assembling they were advised to elect their most eminent members to form a sanhedrim. This body met on the 9th of February 1807, and passed various regulations for the better organization of the Jewish people. The French emperor also took measures for ascertaining the number of Jews then existing in the world; and from the returns made, it appeared that there were 1,000,000 in the Turkish empire, 300,000 in Persia, China, and India; and about 1,700,000 in the West of Europe, in Africa, and America, making altogether an aggregate of about 3,000,000; but as the Jews of Poland are alone computed at 2,000,000, it is probable that the present number of Jews in the world exceeds 4,000,000. Within these few years a society has been formed in Britain for promoting Christianity among the Jews, and the New Testament has been translated into Hebrew; but only a few converts have as yet been made.

IVES, St. a town of Huntingdonshire in England. See Huntingdonshire.

IVES, St. a sea-port town of Cornwall in England, contains a population nearly equal to 3000, and many of the inhabitants are employed in the pilchard fishery.

JUGGERNAUTH, a celebrated place on the sea coast of the province of Orissa, to the temple of which a vast concourse of pilgrims, from all parts of India, annually resort for the purpose of performing their devotions. See Hindostan.

JUGLANS, the Walnut, a genus of plants belonging to the Polyandria class.

IVICA, an island in the Mediterranean, belonging to Spain, and about 50 miles distant from the nearest point of the Spanish coast, is about 20 miles in length and nearly 4 miles in breadth, of a mountainous aspect, and incompassed by precipitous rocks. The soil of the valleys is rich and fertile, fruits are abundant, and as much grain is raised as to answer the demands of the inhabitants. The whole population of the island exceeds 10,000, and the inhabitants are employed in agriculture, the manufacture of salt, or in the fisheries.

JULIAN, the famous Roman emperor, styled the *Apostate*, because he professed the Christian religion when he succeeded to the throne, but having afterwards embraced paganism, he endeavoured to abolish Christianity. He was the younger son of Constantius the brother of Constantine the Great, and was born at Constantinople in 331. Till he reached the 20th year of his age, his studies were directed to qualify him to hold some rank in the church, and it is understood that he was admitted to certain offices of the priesthood; but at the same time he frequently shewed a decided prepossession in favour of the literature and religion of the Greeks. Having associated much with the learned men of that nation, he was at last secretly initiated into all the mysteries of paganism.

In his 25th year, Julian was invested with the title of Cæsar, and having married the sister of Constantius, he was appointed to the government of the territories beyond the Alps; and by checking the inroads of the barbarians, over whom he gained several victories, he acquired the reputation of an experienced general. Constantius viewing Julian as his rival, and being jealous of his fame, was desirous of withdrawing the troops under the command of Julian, but they refused to obey his orders, broke out into open mutiny, and proclaimed Julian their emperor, and, soon after the sudden death of Constantius in 361, left him in full possession of the imperial throne.

Without any disguise, the new emperor professed himself the votary of paganism, and at the same time proclaimed a free toleration to the Christians; but with this apparent moderation, he soon discovered his determination to subvert the Christian faith, wrote a refutation of its doctrines, excluded Christians from public offices, prohibited them from teaching in schools, and issued an edict requiring that the name should be changed from Christians to Galileans. But the Persian war demanding his attention and exertions, he threatened on his return to adopt more vigorous measures for the suppression of Christianity. He was wounded in a skirmish, and soon after died, in the year 363, and the 32d of his age.

The works of Julian consist of his Treatise against the Christian Revelation, of Epistles and Orations, and a Satire on the inhabitants of Antioch, entitled *Misopogon*. An edition in Greek and Latin was published in 1696, in two volumes folio, and an English translation in 1784, in two volumes 8vo, by Mr Duncombe.

JULIERS, a duchy in the circle of Westphalia in Germany, is situated between the rivers Maese and Rhine, is 60 miles long and 30 miles broad, and is famous for a fine breed of horses. The capital of the duchy, having the same name, has broad and regular streets, and is defended by a strong citadel. Woollen and linen manufactures have been established.

JULY, the seventh month of the year, is derived from Julius Cæsar the dictator, who was born in this month, and this name was first assigned to it by Mark Antony, in place of *Quintilius*, as being the fifth month of the year in the old Roman kalendar which was established by Romulus, and commenced in March.

JUNCUS, the Rush, a genus of plants belonging to the Hexandria class.

JUNE, the sixth month of the year, is derived from the Latin *Junius*, the origin of which, according to Ovid, is taken from Juno.

JUNGERMANNIA, Star-tip, a genus of plants belonging to the Cryptogamia class.

JUNIPERUS, the Juniper Tree, a genus of plants belonging to the Monœcia class.

JUNO, in ancient mythology, was the daughter of Saturn and Rhea, and the sister and wife of Jupiter. She was worshipped as the goddess of kingdoms and riches, and styled the queen of heaven. Juno is usually represented in a chariot drawn by peacocks. But, according to Homer, her chariot is adorned with precious stones, the wheels are of ebony, and the horses have reins of gold. As queen of heaven, she had in her train Terror and Boldness, Castor, Pollux, and fourteen nymphs; but the beautiful Iris, or rainbow, was her most faithful attendant, and her usual messenger. The festivals in honour of Juno, denominated *Junonalia*, were celebrated by matrons among the Romans.

IVORY AND HORN MANUFACTURE.

Ivory, horn, and tortoise-shell, which latter possesses some analogous properties, are applied to many useful and ornamental purposes. Under the name *Ivory*, the teeth or tusks of various animals are included, although it is often restricted to the tusks of the elephant. The size and length of the tusk of the elephant are various, according to the age of the animal. They are usually of a curved form, and it is said that those of the largest size are obtained from the African elephant, while the tusks of the elephant from Asia are straighter, and furnish ivory of a better quality. The best ivory is hard, white, and in thin slices translucent; and what is least liable to change from the pure white is always preferred.

The horn of the narwhal, a species of the whale tribe, affords ivory which is as hard as the tusk of the elephant, and is susceptible of a finer polish. Some of these horns are ten feet in length, and they are of a spiral and twisted conical form; but the teeth of the morse, or sea-horse, afford the hardest and whitest ivory. These teeth, which are short and curved, are usually three or four pounds weight; but some have been discovered weighing 30 pounds, and two or three feet in length.

The hardness and close texture of ivory, render it peculiarly suitable for many useful purposes. Very beautiful sculptures are executed in ivory, and it is very generally employed in every kind of turnery. From its elastic property, it is exclusively used for balls employed in billiards and other games of skill. It answers well for the scales of mathematical instruments; it is formed into baskets, and singular specimens of works in ivory are seen in the hollow spheres, several of which are included within each other, that are brought from the East Indies. Ivory is extensively employed in comb-making, and the finer kinds are used for miniature paintings. Different kinds of ivory are described by the workmen, either from its appearance in the natural state, or from remaining unchanged and preserving its fine white colour when exposed to the air. It is found from experience, that the ivory of the sea-horse answers best for artificial teeth, because it is least liable to change when employed for that purpose.

Working ivory.—The instruments with which ivory is wrought are saws, files, and edge-tools of various forms, according to the nature of the work. In using the saw, which ought to be narrow in the plate, it is necessary that it be frequently moistened with water, to make it operate freely. Oil is also employed for the same purpose, although some workmen suppose that it is apt to injure the colour of the ivory, by communicating a yellowish hue. Pumice-stone and tripoli are the materials used in the polishing of ivory. It is susceptible of a very fine polish with chalk mixed with water or oil, applied with leather, and when the surface of the ivory is dry it is afterwards to be rubbed hard with a piece of clean leather.

Dyeing of Ivory.—A green colour is communicated to ivory by steeping it in nitrous acid tinged with copper or verdigrise, or in two parts of verdigrise and one of sal-ammoniac, well mixed together, and dissolved in strong white-wine vinegar. To stain ivory of a purple colour, it is steeped in nitro-muriatic acid, which may be prepared by dissolving one-fourth part of its weight of sal-ammoniac in it. A yellow colour is communicated to ivory by boiling it in a solution of half a pound of alum in one quart of water, and then boiling it in a solution of turmeric-root. A blue colour is given by first staining it green, and then dipping it in a strong and boiling-hot solution of pearl-ashes. It may be stained also of the same colour by first boiling in the tincture of indigo and afterwards in a solution of tartar, which is prepared by dissolving three ounces of cream of tartar in a quart of water.

Horn and Tortoise-shell.—In preparing the horns of bullocks for the manufacture of combs, the tips are first sawn off, and then they are kept in the flame of a wood-fire till they become nearly as soft as leather. They are then split open on one side, and strongly pressed in a machine between two iron-plates; and after being immersed in water they come out hard and flat. The horn is cut into pieces of the intended size; and several of these pieces being laid upon a pair of tongs made on purpose, they are held over a fire of joiner's shavings to soften them. They are frequently turned, and when sufficiently soft they are put into a vice and screwed tight to complete the flattening; and after being shaved and planed with an instrument like a cooper's knife, they are ready to be put into the hands of the workman who forms the teeth.

The property of horn to become soft with heat renders it a very valuable substance, as in that state it can be formed by pressure into any shape, or designs may be communicated to the surface. In this way buttons and knife-handles are made. But for making hollow utensils, or toys, as snuff-boxes, powder-flasks, tubes of opera-glasses, or toothpick-cases, a screw-press is employed. The horn is boiled in water till it become soft, and is then introduced into a mould of brass or iron, consisting of two or more pieces, with cavities between them, corresponding with the form of the utensil or toy to be fabricated. The intended ornaments are engraved on the interior surface of the mould. The horn is placed between the two halves of the heated mould, and the mould being placed in a small screw-press, the halves are forced together to press the horn into the cavity of the mould, and to communicate the impression to its surface. If the ornamented relief be considerable, the operation cannot be finished at a single heat; the press, therefore, with the moulds in it, is returned to the copper and boiled again, and when it is taken out it is screwed tighter by means of a lever. When one piece of horn is too small to fill the mould, two or more pieces are cut to fit and overlap each other a little; and when they are sufficiently softened by boiling in water, the surfaces being strongly pressed, unite together as firmly as if they were one piece.

The machine employed for horn-pressing consists of an iron frame, with a screw passing through the top; and for the convenience of introducing it into the boiler, and of withdrawing it, a small tackle of pulleys is fixed over the boiler, and by the side of the boiler is a block of stone having cavities sufficiently large to receive the press and hold it upright, while the lever is applied to the screw to produce the pressure.

Tortoise-shell, which in some of its properties resembles horn, is obtained from the sea tortoise. The best tortoise-shell is thick, clear, and transparent, and clouded with brown and white. Like horn, it becomes soft in a moderate heat, as that of boiling water, and being pressed in a mould in this state it may be reduced to any form. Two pieces of tortoise-shell may be united into one by heat and pressure. When this is intended, the edges of the pieces should be thoroughly cleaned, and made to fit close to each other. The heat is applied by means of a hot iron above and beneath the juncture, with a wet cloth interposed to prevent the shell from being burnt by the irons; and that the heat may not be dissipated before the union is completed, the iron should be of a considerable thickness.

Dyeing or staining horn.—Tortoise-shell bearing a higher price than horn, has led to many contrivances to prepare the latter by dyeing or staining, so as to imitate the former. The horn to be dyed for this purpose is first pressed into a flat form, and then spread over with a paste, composed of two parts of quick lime and one of litharge, brought to a proper degree of consistency with soap ley. This paste is spread over all the parts of the horn, except such as are to remain transparent, to give it the resemblance of tortoise-shell. The horn is to remain in this state till the paste is dry, when it is rubbed off. Some parts are rendered semi-transparent, by mixing a portion of whitening with part of the paste, to weaken its operation in particular places, and in this way spots of a reddish brown colour are produced, and so much increase the beauty of the imitation, that horn thus dyed, when made into combs, is frequently sold for real tortoise-shell.

Horn is softened by taking a strong ley of wood ashes and quicklime, and having filtered the solution, shavings or chips of horn boiled in it are soon reduced to a paste, which may be coloured and cast into any form that is desired.

The following method is recommended for the preparation of horn leaves in imitation of tortoise-shell: One pound of quicklime, and eight ounces of litharge of silver are to be mixed together, and formed into a paste with urine. With this paste spots are formed on both sides of the bone, according to taste or fancy. When the paste is dry it is rubbed off, and the same operation is repeated. Vermilion prepared with size is then laid over one side of the horn, as well as on the surface of the wood to which it is to be applied. For raised work the horn is formed in a mould of the desired shape, and when it is dry the colour is given with the same paste and vermilion; then glue is applied both to the horn and to the wood to which it is to be fixed; and the two surfaces are then pressed close together. A warm place is necessary for this kind of work, which, after remaining all night, is freed from any roughness by cutting or filing, and the horn is polished with tripoli and lintseed oil.

Tortoise-shell may be also imitated with horn by spotting or marbling the surface with wax, and then washing over the whole surface with a solution of nitrate of silver, which is allowed to dry slowly, and those places with which the solution has come in contact will appear of a brown or black colour, thus exhibiting a considerable resemblance to tortoise-shell.

Comb-making.—When horn which is intended for the comb is flattened, hardened, and smoothed on both sides, it is delivered to the person who cuts the teeth. It is then fastened with wedges, by that part intended for the back, into an instrument called a *clam*. This instrument is furnished with a long handle, on which the operator sits, to keep it firm, and at the same time to allow both hands to be at liberty. A double saw is employed for cutting teeth, each blade of which is something like the small saw of the cabinet-maker; but as the work is left square, and rather in a rough state, especially in the inside edge of each tooth by this instrument, it is followed by another of the shape and size of a case-knife, and having teeth like a file in each flat side. Two others of the same shape, but finer cut, are next employed; and a stroke on each side of the comb being given with a rasp, for the purpose of removing any roughness that may remain on the sides of the teeth, it is then handed over to another workman to be polished with rotten-stone and oil, applied with buff leather.

The operation of making ivory combs is nearly the same as that just described, after the ivory has been sawn into thin slices. Ivory becomes somewhat softer, by being exposed to heat, but that agent cannot be employed to make it pliant. It is divided by the saw, and when the work is very delicate the operation is performed under water, to prevent its being heated or rent by the action of the instrument. Pumice-stone and tripoli are employed for polishing.

It has justly been considered as a matter of surprise, that the teeth of ivory combs should be cut one stroke after the other, by the human hand, and with no other tool than a pair of saws, rudely fastened to a wooden back, and kept asunder with a small slip of wood; and yet with such an implement the delicate superfine ivory combs, having from 50 to 60 teeth in an inch, are made. But this surprise may cease, when it is recollected to what a high degree of perfection mechanical dexterity can be carried. To abridge labour in this kind of work, attempts have been made in some of the manufacturing towns of England, but it does not appear that they have been successful. In the year 1796 a machine was contrived for this purpose by Mr Bundy of Camden-town, for the exclusive privilege of which invention a patent was granted. An account of this machine, illustrated with engravings, appeared in the Repertory of Arts for that year.

JUP JUP

JUPITER, according to ancient mythology, was the supreme deity, and was usually styled by the poets the father and king of gods and men. He was the son of Saturn, and was born and educated on the celebrated mount Ida in the island of Crete. When he grew up he expelled his father from heaven, and divided the empire of the world with his brothers, retaining for himself the power over heaven and earth, assigning to Neptune the sovereignty of the sea, and committing to Pluto the authority over the infernal regions. Jupiter was worshipped under various names, and hence, perhaps, arose the opinion of the existence of three Jupiters; and in the statues of Jupiter which were set up in the temples, erected for his worship by the Greeks and Romans, his attributes were expressed by certain appendages, as the *kind* Jupiter when he dispenses blessings, or as the *terrible* Jupiter when he inflicts punishment on mankind.

The fable of Jupiter is supposed to allude to the history of Noah and his three sons. Noah, who saw all mankind perish in the waters of the deluge, is represented by Saturn; and Ham, Japheth, and Shem, are severally represented by Jupiter, Neptune, and Pluto.

JUPITER, one of the superior planets, is peculiarly distinguished for its brightness. See ASTRONOMY.

JURA, one of the western islands of Scotland, lies to the north of the island of Islay, and is about 26 miles in length, and in some places from eight to nine miles in breadth. See HEBRIDES.

JURA, a chain of mountains in Switzerland, which commences in the canton of Zurich, and, advancing nearly parallel to the Alps, continues its course for 80 or 90 leagues, and in some places rises to the height of 3000 or 4000 feet above the plain of Switzerland. The territory included in this ridge is finely diversified with wood, arable land, and pastures. See SWITZERLAND.

JURY, a certain number of men who are sworn to enquire into, and try such matters of fact as are submitted to their consideration, and to decide on the evidence laid before them. The appellation of *inquest* is sometimes applied to the same persons, because it is their business to inquire into the truth of alleged facts. The *Grand Jury*, which is peculiar to England, consists of 24 of the most respectable inhabitants of the county; they are chosen by the sheriff; and of that number, twelve at least, and not more than 23, that 12 may be a majority, are sworn before they proceed to the business on which they are called to decide. Having received a charge from the judge on the cases to be laid before them, they withdraw and consider the indictments preferred, and the evidence in support of the accusation; and if, upon that evidence, they determine that the case ought to be tried, they declare that the indictment is found, or it is indorsed with the words "a true bill," or, if the evidence be not satisfactory, the indorsation is, "not a true bill." To find a true bill, twelve of the jury must agree.

The *petit jury* consists of 12 persons, who, after hearing the evidence for and against the prisoner, pronounce him guilty or not guilty. Their verdict must be unanimous. The sheriff returns not fewer than 48, and not more than 72 persons, for each assize; and of this number 12 are appointed to each cause. The names of the whole number are written on tickets, are put into a box, and the first 12 drawn are of the jury for that particular cause.

Special juries are appointed for causes of greater intricacy. A rule of court being granted on motion being made, the proper officer, with a list of the freeholders, in the presence of the attornies on both sides, nominates 48 of the principal freeholders; each of the attornies strikes off 12 from this number, and the remaining 24 are returned upon the pannel.

In criminal trials, in Scotland, 45 persons are cited to appear in court; and, of this number, the presiding judge nominates 15 to try the case. They are not required to be unanimous as in England; for even the smallest majority is sufficient to render their verdict of guilty or not guilty legal. In all revenue cases tried in the court of Exchequer, the forms are the same as in England, and the jury of twelve persons must be unanimous: And in the separate institution lately introduced into Scotland under the name of the Jury Court, the forms of the English courts are observed, so that the unanimous verdict of the jury is an essential part of it. This court was established for the purpose of trying issues in civil cases; but this mode of trial is not left to the choice of the parties, but depends on the discretion of the judge before whom the cause is brought in the Court of Session.

JURIN, JAMES, a learned physician, who held the office of secretary to the Royal Society of London for many years, and distinguished himself by his mathematical and physiological investigations. In the Philosophical Transactions for 1718 and 1719, he drew up memoirs on the force of the heart, and calculates that it is equal to a weight of 15 pounds four ounces; and, in another communication, he details some experiments to determine the specific gravity of the human blood. These papers, along with some others, appeared in a separate publication in 8vo, in 1732, under the title of "Physico-Mathematical Dissertations." An essay by Dr Jurin, on distinct and indistinct vision, was published in Smith's System of Optics. He wrote also on the motion of running water; and, on all the subjects now noticed, he was involved in a good deal of controversy. He was a zealous advocate for inoculation for small-pox, and clearly established the utility of the practice by a comparison of the respective mortality of the natural and inoculated small-pox. He died in 1750.

JUSSIEU, ANTONY DE, a learned French physician and botanist, was born at Lyons in 1686, and being admitted a member of the medical faculty of Paris, was appointed professor of botany in the Royal garden. He was the disciple and successor of Tournefort, whose system he adopted and improved. He travelled in Spain and Portugal on botanical researches, and imported and described some plants from those countries,—wrote a treatise on Simarouba bark and its use in dysentery,—published the history of the Royal garden at Paris, a discourse on the progress of botany, the analogy between plants and animals, and was the editor of the institutions of Tournefort, with a life of the author. He died in 1758.

JUSSIEU, BERNARD DE, was the brother of the preceding, and was born in 1699, was also a member of the medical faculty of Paris, and was no less distinguished as a botanist. He was appointed botanical demonstrator in the Royal garden, was the author of a catalogue of the plants which grow in the neighbourhood of Paris, and another of the shrubs that may be reared in the same places. While he was on a visit to England, he had an opportunity of seeing the cedar of Lebanon, of which he carried plants with him on his return to France, which were, for the first time, introduced into that country. In the course of his physiological investigations, he discovered the manner in which the farina of plants is made to explode; and he confirmed the opinion of Peyssonnel, that most corals, corallines, and madrepores are animal and not vegetable productions; and he was the author of a memoir on the efficacy of eau-de-luce in the bite of the viper. He died in 1777.

JUSTICE OF THE PEACE is a magistrate appointed by a special commission from the king and under the great seal, for the purpose of keeping the peace within the limits of a certain district. The nature of the office and extent of the duties of such a magistrate are ascertained by the commission and the statutes passed for fixing his powers. Justices of the peace were originally elected by the county, and were first known in the time of Edward III. They were then called *warders* of the peace, and in each county the number did not exceed two or three. The number is now regulated by the discretion of the Lord Chancellor by the king's leave. In England, the justices of the peace must possess certain qualifications, which are specified by act of Parliament.

The institution of justices of the peace in Scotland is of more modern date. Since the Union they are nearly on the same footing as those in England, but without the *custos rotulorum*, and the distinction of the *quorum* is not observed. The office and duties of these magistrates are explained and illustrated in the works of Burn and Williams; and in a later treatise on the same subject, by G. Tait, advocate, published at Edinburgh.

JUSTICIA, MALABAR NUT, a genus of plants belonging to the Diandria class.

JUSTIN, a Latin historian, who is supposed to have lived in the second century of the Christian era, and during the reign of Antoninus Pius. His history is an abridgement of that of Trogus Pompeius, in forty-four books, the original of which is lost. The composition of Justin is not without purity and elegance, his narrative is perspicuous, and his style sometimes rises to eloquence; and, on account of these qualities, his work is admitted among modern classics for less advanced scholars. It comprehends the history of almost every nation from the time of Ninus, the founder of the Assyrian monarchy, to the reign of the Roman emperor Augustus. The Delphin edition of Justin, published at Paris in 4to, in 1677,—the edition of Gronovius, with notes of various authors, at Leyden in 8vo, in 1719 and 1760,—and Hearne's at Oxford in 8vo, in 1703, are reckoned the best.

JUSTIN, surnamed the *Martyr*, was one of the earliest and most learned writers of the Christian church, was a native of the ancient Sichem, a city of Samaria in Palestine, and was born about the close of the first century; was instructed in the philosophy of the age; visited Egypt, the grand seat of literature and mysterious religion, and became first a disciple of the Stoic sect, and afterwards of the Peripatetic school. According to the history of his life, being refused admission into the Pythagorean school, he determined to devote himself to the study of the Platonic philosophy. He withdrew to a retired spot near the sea-shore; and in one of his solitary walks, he was accosted by a venerable old man; the conversation between them induced him to examine the writings of the prophets and apostles; and this examination finally led to his conversion to the Christian faith, about the year 133, and during the reign of the emperor Adrian.

About the commencement of the reign of Antoninus Pius, Justin appeared at Rome to promote and defend the cause of Christianity; and to mitigate the severity of persecution to which its professors and adherents were exposed, he drew up an *Apology*, which was presented to the emperor in 140. He next visited Asia, and at Ephesus entered into a keen disputation with a learned Jew on the Christian revelation, of which he wrote an account under the title of "A Dialogue with Trypho." Returning to Rome, Justin was involved in a dispute with Crescens, a Cynic philosopher and a bitter enemy of the Christians; and, finding the persecution of his brethren yet unabated, he presented to the emperor Marcus Antoninus, in 162, a second *Apology*. But his remonstrances had the effect of increasing its severity against himself. He was charged with impiety, or of neglecting the pagan rites, thrown into prison, and, on his trial, refusing to sacrifice to the gods, he was condemned to be scourged and then beheaded. He suffered martyrdom about the year 164, when he was in the 74th year of his age. The two Apologies and the Dialogue with Trypho already alluded to, are the principal works of Justin Martyr; the first Apology is entire, but some parts of the other treatises are wanting; and although it be obvious that he mixed up the language and notions of the Platonic philosophy with the simple doctrines of Christianity, he is acknowledged to have been a faithful, zealous, and valuable advocate for Christianity. Some other works, on doubtful authority, are ascribed to Justin. The best editions are reckoned that of Paris in 1742, and that of London in 1722, both in folio.

JUTLAND, NORTH, a large province of Denmark, and with the duchy of Sleswick, which is sometimes called South Jutland, includes a considerable portion of the Danish territory, is a peninsular region, having the sea on all sides excepting on its southern limit, where it is united to Sleswick; the length from north to south is about 180 miles, and the average breadth is reckoned about 75 miles; but the coasts both on the east and west sides are indented with numerous bays and gulphs which form excellent harbours, and one of these gulphs, Lymfiord, stretches from the Cattegat to within three miles of the northern ocean.

Aspect.—The aspect of North Jutland is generally low, sandy, and naked. Numerous sand-banks, which often prove fatal to mariners, stretch along its northern shores, but the eastern coast is bordered with rocks, which in many places exhibit picturesque scenery. The most fertile tracts lie towards the south, and the eastern districts are clothed with forests of birch, fir, and oak. Numerous lakes and marshes are scattered over the surface of the province, but it contains no rivers of any magnitude. To check the desolating effects of the loose sand, the bent grass, whose roots stretch rapidly along the surface, is planted, and carefully protected under heavy penalties from being cut or rooted up.

Population.—The population of Jutland is estimated at 400,000, and the inhabitants are occupied in agriculture, the fisheries, or manufactures.

Agriculture.—The improvements in modern agriculture are not extensively known in North Jutland. The principal corn crops are rye and oats, and barley, pease, and beans are also cultivated; potatoes form the only green crop yet introduced; and composts of moss, lime, and dung, are employed as manure, and are found suitable for the light soil of the country. Inclosures, which are so essential to good husbandry, are said to be little known. Attention is paid to the breed of horses, and the extensive pastures afford nourishment to great numbers of black cattle, many of which are exported. The sheep of this province, which are reckoned amongst the best in Denmark, are a small hardy breed, resembling the white faced sheep of Scotland. The introduction of the Spanish breed, which was attempted, has not succeeded.

Fisheries.—The numerous gulphs which penetrate the shores of Jutland abound with fish, and furnish occupation to the industry and enterprise of a great number of the inhabitants. Immense shoals of herrings and eels appear in Lymfiord; and on other parts of the coast and inlets, great quantities of cod, flounders, and salmon are taken, and exported to the southern provinces of the kingdom.

Manufactures.—Some woollen cloth is manufactured for exportation, and a good deal of coarse cloth for home consumption is also made; and the spinning of wool, which is knit into stockings, and the produce also exported, occupies the industry of the females in the country. Among other manufactures are enumerated black pottery, potash, alum, white-lead, and soap; and hats, gloves, and fire-arms at Aalbourg.

Trade.—The inland trade of Jutland is greatly facilitated by means of its numerous gulphs and inlets. The staple commodity is grain, and chiefly rye and oats, of which 500 or 600 ship loads are annually exported from Aalbourg alone for the Danish isles and Norway.

Divisions.—Jutland is divided into four districts, of which Aalbourg occupies the northern part of the province. Its chief town of the same name stands on the south coast of the gulph of Lymfiord.

JUVENAL, Decius Junius Juvenalis, a celebrated Roman satirist, was a native of Aquinum in Campania, and is supposed to have been born about the year 38 of the Christian era, and near the beginning of the reign of Claudius. It is alleged he was either the son, or the adoptive son of a rich freedman, who bestowed upon him a liberal education, and afforded him opportunities of improvement in the study of eloquence. Part of his life was spent in the pursuits of the bar; and his first attempt in satirical poetry is said to have been directed against an actor of pantomime, who was a great favourite with Domitian. The poet having fallen under the displeasure of that emperor, was sent to Egypt, under the pretext of assuming the command of a cohort in the army. But it is supposed by others that he was banished to Egypt in the year 95, along with the philosophers who had incurred the capricious dislike of Domitian. The exiles were recalled by Nerva the successor of Domitian, and from that period Juvenal spent his life in tranquillity at Rome. But no small degree of uncertainty prevails relative to the events of his life, and some controversy on the style of his writings. He is supposed to have died about the year 128.

Sixteen of the satires of Juvenal are yet extant, and they stand conspicuous in that class of productions in which serious invective is employed, and of which vice rather than folly is the object. But although he appears to be a sincere lover of virtue, and his sentiments are distinguished by elevation and dignity, the grossness of his language and descriptions afford a sad proof of the moral indelicacy of the age. As a poet he possesses more vivacity and animation than good taste, and many of his maxims of morality and religion are delivered with great force; and although the general character of his style is tumid and hyperbolical, a rich vein of poetry and picturesque expression is diffused through his writings. Among the best editions of Juvenal are reckoned the "Variorum of Grævius," at Amsterdam, in 8vo, 1684; the "Delphin," at Paris in 4to, in the same year; and "Casaubons," at Leyden, in 4to, in 1695. The English reader has an opportunity of perusing them in several translations, among which the latest and best are those of Mr Gifford and Mr Hodgeson.

IXIA, a genus of plants belonging to the Triandria class.

IXORA, a genus of plants belonging to the Tetrandria class.

K.

K is the tenth letter, and the seventh consonant, of the English alphabet. It is sounded by a guttural expression of the breath through the mouth, with a depression of the lower jaw and opening of the teeth. The sound is nearly the same with that of the hard *c* or *qu*, and it is used for the most part only before *e*, *i*, and *n*, in the beginning of words, as ken, kill, know. It was formerly joined with *c* at the end of words, but is now generally omitted, at least in words derived from the Latin, and *public*, *music*, are used for *publick*, *musick*. But it is still retained in words of one syllable, as *jack*, *block*, *black*, *mock*.

The letter K, which was little used among the Latins, and indeed was unknown to the ancient Romans, excepting in words borrowed from the Greek, is derived from the *cappa* of that language. It is seldom found in any of the Latin authors, with the exception of the word *kalendae*, where it is sometimes substituted for *c*, but Carthage is frequently spelt on medals with a *K*, and sometimes the letter *K* alone stood for Carthage; and the capital *K* on the reverse of the medals of the emperors of Constantinople, signified Konstantinus.

In old charters and diplomas, the letter *K* has various significations, as K.R. for *Chorus*, K.R.C. for *Cara Civitas*, KRM. for *Karmen*, KR.AM.N. for *Carus Amicus Noster*, KS. for *Chaos*.

As a numerical letter, K signifies 250; and, with a stroke at top, $\bar{K}$ denotes 250,000.

KAARTA, a kingdom of Africa, through which

Mr Park passed in his journey from the Gambia to the Niger, and which, according to his description, consists of extensive sandy plains interspersed with rocky hills. From the surprise expressed at Mr Park's complexion, it appears that the negro inhabitants were altogether strangers to white men.

KAATSKILL, a township of the state of New York in North America, is situated on the west bank of the river Hudson, five miles south from the town of the same name, and 125 miles north from the city of New York. Near this place commences the lofty ridge which has probably given name to the township, and which forms the first part of the Alleghany mountains, which traverse the whole extent of North America.

KADIAK, or KODIAK, an island in the Northern Pacific ocean, separated by a strait from the peninsula of Alaska, and being 100 miles in length, and from 40 to 50 miles in breadth, is one of the largest of that chain of islands which lies between the continents of Asia and America. Some parts of the coast are precipitous, the interior districts of the island are mountainous, and the rocks belong to the primitive class, and have, in many places, a very thin covering of soil. The latitude of the island is about 57° north. The climate is severe and unsteady, and the snow sometimes remains on the ground during one-half of the year. During summer, rains are frequent, and thick fogs often obscure the air. On some parts of the north-east coast different species of pines, with alder and some other trees, form considerable forests; raspberries grow to a large size; potatoes are said to thrive well; but barley, peas, and beans, scarcely come to maturity before winter.

Among the native quadrupeds are enumerated different species of fox, the beaver, the ermine, and the marmot, which are hunted for the sake of the fur; the rein-deer is also a native of the island; and black cattle, sheep, goats, and hogs, have been introduced from the Russian settlements. Sea-fowl are found in vast multitudes. Fish are abundant in the straits and bays; and the holibut is sometimes taken of the immense weight of more than 600 pounds.

The whole amount of the population of this island was stated in 1805 at 4000, and it is supposed to be on the decline. In their appearance, dress, manners, and customs, as well as in the construction of their houses, boats, hunting and fishing-apparatus, they resemble the natives of the Aleutian islands. It is supposed that the Russians were acquainted with this island soon after the middle of the 18th century; but it was not till the year 1783 that any settlement was formed This colony experienced a good deal of opposition from the inhabitants; but in this, as well as in some of the neighbouring islands, the inhabitants were at last brought to acknowledge the Russian authority. This island now constitutes the chief Russian settlement in the Northern Pacific ocean, and is the great depot of all the furs collected in the neighbouring islands on the coast of America. The town of Alexandria, which is defended by a small fort, and has the advantage of an excellent harbour, stands on the north-east coast, and is furnished with a church, a school for the children of the natives, store-houses, and a barrack for convicts sent from the mother-country.

KAEMPFER, ENGELBERT, a German naturalist, was a native of Westphalia, and was born in 1655; and having early discovered a strong bias to the study of languages, medicine, and natural history, and having completed his academical education at Konigsberg in Prussia, he accepted the place of secretary to the Swedish embassy to Persia, and remained for some time in the character of physician in Georgia. The Dutch fleet, then cruizing in the Persian gulf, afforded him an opportunity of changing his situation; he entered as a naval surgeon, visited many of the Dutch and English settlements in the East, and finally reached Batavia in 1689. From that place he accompanied the Dutch embassy to Japan,—returned to Europe in 1692,—and soon after was admitted to the degree of doctor of medicine at the university of Leyden.

The natural curiosities, drawings, and copious journals which the industrious and indefatigable naturalist had made in the progress of his extensive voyages and travels, furnished him with a great mass of valuable information, which he now began to digest and arrange for publication. Of this work, under the title of *Amoenitates Exoticæ Politico-medicæ*, five fasciculi only had appeared previously to the death of the author in 1716. His history of Japan, with other manuscripts, and with numerous drawings, was purchased by Sir Hans Sloane; and under his auspices a translation of that work into English was published in London in 1727, in two volumes 4to. The same work appeared in Germany in 1777 and 1779. Kaempfer was also the author of a Herbarium, or catalogue of plants of the countries he visited beyond the Ganges; and, on account of his learning, extensive knowledge, and accurate observations, his writings have been often referred to by succeeding authors.

KAEMPFERIA, ZEDOARY, a genus of plants belonging to the Monandria class, and so named to commemorate the German naturalist and historian of Japan.

KAESTNER, ABRAHAM GOTTHELF, an eminent German mathematician, was born at Leipsic in 1719; was privately instructed under his father's care; at the age of 12 became a student in the university; and while he was destined for the profession of the law, his own inclination led him to pursue mathematical learning. Having obtained some academical degrees, he commenced teacher, and was afterwards nominated extraordinary professor of mathematics, and finally succeeded to the chair of natural philosophy and mathematics in the university of Gottingen; and, with the title of aulic counsellor afterwards conferred on him, he occupied that place for the long period of forty-four years, till his death in 1800.

The talents of Kaestner are chiefly admired in the skill and address with which he has exhibited the principles of mathematical science in a perspicuous and practically useful form. His " Elements of Arithmetic," which are peculiarly entitled to this character, soon became the text-book in the German universities. He was the author of " Observations on Mining, and the method of Measuring Heights with the Barometer," and the translator of "Hellot's art of Dyeing," from the French, "Smith's Optics," and some other works. His last work, the "History of Mathematics," in four volumes, appeared a short time before his death, and is regarded as a valuable collection of facts connected with the progress of the science.

KALENDAR is a table in which the distribution of time is made in the order of days, weeks, and months throughout the year, and in which it is also usual to mark the dates of important events, either of a religious or civil nature. The word is derived from *kalend*, or *calend*, which in the Roman chronology denoted the first day of every month; and this word is taken from the Greek, signifying to call or proclaim, because the chief priest, whose duty it was to watch the appearance of the new moon, summoned the people to the capitol, and with a loud voice proclaimed the number of kalends, or the day on which the nones would happen, or, according to another account, proclaimed the several feasts or holidays in the month.

Roman kalendar.—The kalends were reckoned backwards; thus, the first day of May was called the kalends of May, the 30th or last day of April, the day before the kalends, *pridie kalendarum*, or second of the kalends of May; the 29th of April, the third of the kalends of May; and so on to the 13th April, when the *ides* commence, which are also reckoned backwards to the fifth of April; the *nones* then commence, and are numbered backward to the first, which then takes the name of the kalends of April.

To find the day of the kalends corresponding to any day of the month, according to the modern computation of time, the following is the rule: To the number of days yet remaining of the month, add two, and this number will denote the day of the kalends of the succeeding month; thus, suppose it is required to convert the 22d of April to the corresponding day in the old Roman kalendar, eight days are wanting to complete that month, or to bring it to the first of May, the day on which the kalends of May commence; two being added to eight, the remaining number ten marks the tenth of the kalends of May, because the last day of April is called the second day of the kalends, the last but one is the third day, and so on.

According to the Roman kalendar, which owed its origin to Romulus, the year was divided into ten months. The commencement of the year was on the first of March; and this distribution of time proceeded on the supposition that the sun performed his annual course in 304 days. The kalendar of Romulus was reformed by Numa, who added two months, January and February, to the year, so that his year, commencing on the first of January, consisted of 355 days. In imitation of the Greeks, he made an intercalation of 45 days, which he divided into parts, intercalating a month of 22 days at the end of every second year. Much confusion followed this mode of distributing the months of the year; and to remove the difficulties with which it was attended, Cæsar, as sovereign pontiff, divided the whole year into 365 days, corresponding with the period of the sun's annual revolution. The year in which this necessary correction was made consisted of fifteen months, or 445 days, and it took place about the 42d or 43d year before the Christian era.

The Roman kalendar, called also the *Julian* kalendar, from its reformer Julius Cæsar, is disposed into periods of four years, the first three of which, called common years, consist of 365 days, and the fourth, called *bissextile*, or leap year, includes 366 days. The additional day, reckoned every fourth year, is made up of the six hours omitted in the computation. But, as eleven minutes are wanting to make up the six hours complete, a day must be subtracted every 134 years.

Gregorian kalendar.—The reformation of the kalendar, or the new style, as it is called, was introduced by Pope Gregory XIII. in the year 1582, when ten days were thrown out of the month of October to restore the equinox to its place, namely, the 21st of March. This was called the Gregorian kalendar, or Gregorian year. The same pontiff appointed that the 100th year of each century should have no bissextile, excepting in each fourth century, or, in other words, a subtraction was made of three bissextile days in the space of four centuries. The reason of this subtraction is, the deficiency of eleven minutes from the six hours reckoned up every four years.

This kalendar was introduced among the Protestant states of Germany in the year 1700, when eleven days were at once thrown out of the month of February. The Gregorian kalendar, or the new style, was not admitted into Britain till the year 1752, when it was established by public authority.

KALI is the specific name of a plant which yields the substance called *kali*, or alkali, or the vegetable alkali,—or, as it is more usually denominated in modern chemistry, potash.

KALMIA, DWARF AMERICAN LAUREL, a genus of plants belonging to the Decandria class, and so named in honour of professor Kalm, a learned Swedish naturalist and traveller in North America, of which country the species hitherto discovered are natives.

KALMUCS, a tribe of Tartars inhabiting the greater part of the region called Western Tartary. Their territory extends from the 40th to the 52d degree of north latitude, being nearly 700 miles from north to south, and nearly 2000 miles in length from the Caspian sea to the Altaian chain of mountains. As the different tribes of Kalmucs depend for their subsistence on their flocks and herds, it becomes necessary to remove from place to place to obtain pasturage, and hence they have been known from the earliest periods as a migratory people. For this purpose they are provided with moveable habitations, which have a conical roof, and are covered with a kind of woollen stuff like felt. The frame of these huts can easily be taken to pieces, and put up in a small compass. Their riches consist in the number of their flocks as well as in the number of the horses and camels which they possess, and which are necessary for riding, or for the draught, when they remove from place to place.

The Kalmucs are conspicuous as excellent horse-

Kammeni
‖
Kamsin.

men; their arms consist of bows and arrows, lances, poniards, and crooked sabres, and those who are more wealthy are furnished with fire-arms. Much of their time is spent in diversions. They are fond of falconry, and hunting of all kinds forms one of their principal amusements.

Milk, cheese, butter, and fresh meat are furnished by their flocks. Their ordinary drink is milk, and in summer, when milk is abundant, it is fermented, and from the fermented liquid a spirituous liquor is obtained by distillation.

It seems a remarkable circumstance, that a migratory people should have been subjected from time immemorial to the absolute authority of khans and princes, which is transmitted by hereditary succession. No traces have been discovered in any of their traditions that they have ever been in a state of independance.

When a horde of Kalmucs intends to remove in search of fresh pasture, which in summer usually takes place every six or eight days, some persons are dispatched to discover the best place for the khan or prince, and for the huts which contain the idols of their worship. The march is begun by them, and they are followed by the whole troop, each selecting for himself the place he thinks most convenient for his tent. The camel that is loaded with the most precious furniture is adorned with little bells, and the rest march in a line, one behind the other. On the days of their march the women and girls are dressed out in their best clothes; and to them, along with the boys, is entrusted the charge of conducting the flocks and beasts of burden. During the march they beguile the tediousness of the journey with songs.

KAMMENI, or KAMMENOI, signifying *Burnt Islands*, are two islands in the Greek Archipelago, distinguished by the names of Great and Little, the former of which was known to the ancients, but the latter was thrown up by a volcanic eruption from the bottom of the ocean in the year 1473. In the beginning of the 18th century, another small island between the two now mentioned, and about a league distant from Santorin, was also thrown up. Shocks of earthquakes were felt in the neighbouring islands from the month of May 1707 till February in the succeeding year, and a great mass of rock appeared on the surface of the water. But previously to this, smoke, ashes, flames, and pieces of stone were projected to a great height in the air. For several months the fire and smoke were ejected. The new island is about a league in circumference, and in some places rose 200 feet above the surface of the sea. The depth of the water close to the island is from 30 to 35 fathoms; but at a little distance no bottom is found.

KAMSIN, a hot southerly wind which is common in Egypt, and which is known in that country by the general name of the wind of 50 days, because it prevails most frequently in the 50 days preceding and following the equinox. These winds also, from their peculiar effects, are called hot winds of the desert, and poisonous winds. According to the description of some travellers, plants are withered and destroyed by the effects of this wind, and it is not less destructive to animal life. When it comes on, the inhabitants of towns and villages shut themselves up in their houses, and travellers in the desert instantly retire to their tents, or to wells dug in the earth, where they remain till its violence abates. It usually lasts three days, but if it exceed that time it becomes altogether intolerable. This wind is not less injurious to animals, and even the hardy camel, to avoid its deleterious effects, buries its nose in the sand, and remains in that position till the fury of the blast is exhausted.

Kamtschatka.

KAMTSCHATKA, a large peninsula in the north-eastern extremity of Asia, and included within the limits of Siberia, lies between the 51st and 62d degree of north latitude, and has for its boundaries on the south and east the Pacific ocean, on the west the sea of Ochotsk, and on the north the isthmus, of about 40 miles in breadth, which divides it from the country of the Koriacs. The length from north to south is about 600 miles, and the breadth where it is greatest about 300 miles.

Aspect.—The face of the country throughout Kamschatka is chiefly mountainous, and the surface is covered with heath and stunted trees. The soil of the vallies is more fertile, and answers for the cultivation of culinary vegetables. But no successful crops of grain have been obtained. Hemp, it is said, has been tried with advantage.

Among the native vegetable productions are enumerated wild garlic, celery, purselane, angelica, raspberries, and strawberries.

Climate.—Fogs and frequent rains prevail during the summer months, especially in the southern districts. The winter is severe, and the snow, which falls in heavy showers, lies on the ground from October till April or May. The peninsula is divided through its whole extent by a chain of mountains, in which are several volcanos, and some of them in a state of activity. The rivers, which descend from the mountains with rapid streams, discharge their waters into the eastern ocean, or the sea of Ochotsk.

Natural history.—The bear, the beaver, the fox, otter, and hare, sable, ermine, and marmot, the wolf, weasel, and wolvereen, some of which are highly valued on account of the fur, are the most common animals. The number of cattle is small; a few horses are kept at the settlements belonging to government, and the dog is one of the most useful of the domestic quadrupeds. Wild fowl, and particularly sea-fowl, appear in great flocks, and the coasts and rivers abound with all kinds of excellent fish.

Population, &c.—The whole population of this peninsula is supposed not to exceed 8000. Great numbers of the inhabitants have been carried off by epidemic diseases, and especially by the small-pox. The natives have a swarthy complexion, black hair, a round face, small sunken eyes, thin eye-brows, large mouths, and thick teeth. They are of short stature, and although broad between the shoulders, their legs and arms are slender. They are distinguished for their kindness, honesty, and hospitality, as well as for their fidelity and attachment to their superiors. They reside chiefly in small villages dispersed throughout the country.

The food of this people consists of fish, which is either eaten fresh or hung up to dry for some time.

The roes of fishes, or *caviare*, which is prepared in different ways, constitutes a favourite part of their food, and the flesh of land and the larger sea animals is boiled with herbs and roots. Excepting coarse cloths purchased from the Russian traders, the clothes of the inhabitants are composed of the skins of deer, dogs, land and sea animals, and sometimes of birds, and the same dress is said to be common both to men and women.

Occupations.—The chief occupations of the natives of Kamschatka are hunting and fishing. Those animals which furnish furs are the objects of the chase, and from this source are derived the principal materials of their trade with the Russians. They have two kinds of houses, one of which, called *Balagan*, is appropriated for the summer habitation. The house for the winter residence is constructed of strong wooden posts fixed in the ground. The walls are made of a kind of wicker work covered with turf, and an opening in the centre of the roof serves for chimney, door, and window.

The natives of Kamschatka travel in sledges drawn by dogs, four or five of which being yoked together are capable of drawing two persons; but a hundred dogs have been seen yoked in a single carriage belonging to a man of rank.

Kamschatka was discovered by the Russians about the close of the 17th century, and in the course of a few years the whole peninsula was reduced under their authority. The peninsula is divided into four districts, which form one government. *Bolcheretsk* is a town on the west coast, containing about 300 inhabitants, and is the residence of the governor; *Peter Paulowska*, or the town of St Peter and St Paul, at the bottom of the fine bay of Avatchka, is composed of about 30 houses; *Nishnei-Kamschatka* is about 20 miles up the river of the same name, contains 150 houses, and is a principal place for the inland trade of the country; and small villages are attached to the forts on different parts of the coast.

KAN, or KHAN, the name of an officer in Persia, which nearly corresponds with that of governor in Europe. The Kans of provinces, countries, and cities, are distinguished by certain additions to their names.

KANT, IMMANUEL, a celebrated German metaphysician, and founder of the Critical Philosophy, was a native of Konigsberg in Prussia, and was born in 1724; and, on account of the humble station of his parents was educated at a charity school, till he was sent by the kindness of an uncle to the college Fredericianum. When he was removed to the university in 1740, he attended the lectures on philosophy, mathematics, and theology, and prosecuted his studies with great diligence and zeal. His object was to acquire information on all subjects; but his chief predilection was for mathematics and the kindred sciences. For the period of nine years after he completed his academical course, he was employed as tutor in different families; and when he returned to Konigsberg, he maintained himself by giving private instruction to pupils, and was thus enabled to live at his native college with credit and respect.

At the early age of 22, Kant commenced his literary career by the publication of "Thoughts on the Estimation of the Animal Powers, with Strictures on the Proofs advanced by Leibnitz and other Mathematicians on this point;" and eight years afterwards, "An Examination of the Prize Question of the Berlin Society,—Whether the Earth, in turning round its axis, by which the succession of day and night is produced, has undergone any Change, and what are the Causes," &c. The judgment and learning displayed in the discussion of these topics, raised his character as a promising mathematician and natural philosopher, and secured to him the degree of Master of Arts from the university. While in the capacity of a private tutor, he employed his spare hours in acquiring a knowledge of the French and English languages, that he might be able to read the authors in the original of those subjects to which his investigations were particularly directed. When he became a graduate of the university, he commenced a half-yearly course of lectures on pure and practical mathematics, which for many years were attended by crowded audiences, and, as well as the publications which he sent annually from the press, served to confirm the reputation he had already acquired.

In 1755, a treatise on the Universal Natural History and Theory of the Heavens, according to the Newtonian system, was ready to be presented to the world; but the publisher having failed in trade before its appearance, proved a severe disappointment to the author, who could not recover the work, and who had the mortification to see another philosopher, at the distance of six years, advancing the same principles. In the succeeding year his first work connected with metaphysical subjects appeared, and was followed by others, in which different branches of natural philosophy were treated. In 1765 he published, under the title of "Intelligence respecting the Arrangement of Lectures for the Winter half-year," an excellent system of lecturing on metaphysics, logic, and ethics.

The reputation which this philosopher had now acquired, as well as his numerous literary productions, recommended him to royal patronage, and offers of a professorship in different universities were made to him; but his strong attachment to his native place induced him to decline the proferred honours, and it was not till the year 1770, that an opening in the metaphysical department happened in the university at Konigsberg. The inaugural dissertation, which he defended on his admission, and which was afterwards published, contains the outlines of his philosophy, which has since been known under the name of the *critical system*. This system excited a great deal of attention, and gained converts, not only in the university of Konigsberg, but, in the course of a few years, throughout the whole of Germany. His labours were now confined to metaphysical subjects; and almost all his future publications were connected, either more or less directly, with these subjects; and he continued these labours till the year 1798, when, in a work presented to the world that year, he took a formal leave of the public, and not long afterwards, resigning all his official situations, he withdrew from the bustle and anxiety of active life. He died in 1804, when he had nearly reached the eightieth year of his age.

The intellectual qualifications of Kant were of an extraordinary character,—he possessed a wonderful faculty of unfolding the most abstruse principles, and such a facility in deducing every thing from his own reflections, as gave him such a habitual familiarity with himself that he could not readily enter into the sentiments of others. He had also the singular faculty of retaining words and representing absent things to himself, and hence he was able to describe objects an account of which he had only read in books, even with more distinctness and precision than many who had seen them. In detailing a description of Westminster Bridge, when a native of London was present, the dimensions, form, and character of the structure were so minutely given, that the Englishman was surprised, on his inquiring how long he had been in London, and whether he had not devoted much of his time to the study of architecture, to be informed, that the philosopher was no architect, and that he had never been without the limits of the Prussian territory. By reading alone, he made himself master of all the minute details of chemistry, although he did not commence the study till he had reached the 60th year of his age.

The *critical philosophy*, as it has been called, or the peculiar views of Kant on metaphysical subjects, were not only very generally admired in Germany, but, for a time, excluded almost every other system from the Protestant universities. The obscurity of the language which he has employed in the developement of this system, and the extreme subtlety of his reasonings have rendered it very difficult of comprehension. Even an abridged view of its fundamental principles could not be given within narrow limits, if we could indulge the hope of rendering it intelligible. Such readers, therefore, as wish to be acquainted with the philosophy of Kant, are referred to Aikin's *General Biography*.

KAOLIN, one of the ingredients of the Chinese porcelain, consists of alumina, lime, and a portion of siliceous earth, and is supposed to be a decomposed feldspar, as that substance has been found to answer the same purpose as the Chinese kaolin. Petuntse, the other ingredient of the oriental porcelain, which forms no tenacious paste with water, is of a siliceous nature. See Porcelain.

KAOUTCHOUC, or Caoutchouc, or Elastic Gum, is a milky vegetable juice, obtained by wounding several species of trees, natives of tropical regions, and being deprived of water by evaporation assumes the colour and consistence of the elastic gum or Indian rubber. See Chemistry.

KARACK, or Kareck, an island nearly in the middle of the Persian gulph, about six miles long and four miles broad, and about 30 leagues distant from the mouth of Bassora river, produces some corn and esculent vegetables, and was taken possession of about the middle of the 18th century by a Russian adventurer, in name of the Dutch, but has been since restored to the authority of its native rulers. The inhabitants who, under the Dutch, were about 2000, have dwindled down to L.400. Fishing and agriculture are their chief occupations.

KARATSCHAI, a tribe of Tartars, sometimes distinguished by the appellation of Black Circassians, inhabits the banks of the rivers Chursuk and Kuban, at the foot of Elbrus, one of the highest ridges of Caucasus. The territory inhabited by these people produces abundance of wheat, barley, and tobacco; and sheep, asses, mules, and horses are enumerated among their domestic animals. They have some woollen manufactures, and the women are employed in the making of gold and silver thread. The furs of wild animals, some woollen cloth, tobacco, sulphur, and honey constitute the principal materials of their trade, which is carried on with the neighbouring tribes or with Russia.

This tribe of Tartars, in their features and manners, greatly resembles the Georgians. They are divided into three ranks, princes, nobles, and peasants; they are strict observers of the Koran, and not a little addicted to superstitions, but are distinguished for the mildness of their disposition, their fidelity, and hospitality.

KARNAC, a village near Thebes, in Upper Egypt, which stands on part of the site of a single temple, the ruins of which, yet visible, seem to indicate that it was the largest in the world. This temple, it is supposed, as well as that of Luxor, was built in the time of Sesostris, when Egypt was in the highest degree of prosperity. The portico alone is composed of 100 columns, the smallest of which is not less than seven and a half feet in diameter, and some of them reach the enormous magnitude of twelve feet. The plan of this temple is said to be of the grandest character; but Denon, who describes it, conjectures that the embellishments were added long after the building of the temple, as they exhibit a more correct and chaste style. See Denon's *Travels*.

CASSINA, or Cashna, a kingdom of Africa, lying on the north side of the river Niger, and between the kingdom of Bornou and Tombuctoo, in its climate and productions bears a strong resemblance to those of the former. In its course through this territory, the river Niger is extremely rapid. Gold dust, cotton cloth, senna, goats skins, and civet are exported in exchange for horses, coarse woollen cloths, Turkey carpets, linens, silks, and cutlery. The city of Kassina is 650 miles south-west from Bornou, and about the same distance south-east from Tombuctoo.

KATTEGAT, a narrow sea between Sweden and Jutland in Denmark, is nearly shut up at its southern extremity, by the islands of Zealand and Funen, and between Zealand and Sweden is the sound or passage into the Baltic, at which all foreign ships pay tribute to the Danes. The greatest depth of water is 35 fathoms, near the sound it is 16 fathoms, and approaching Copenhagen it decreases to four fathoms.

KAUFFMAN, Angelica, a painter of some eminence, was a native of Switzerland, and was born in 1740. The father, who was himself an artist, was at great pains to cultivate and improve the promising talents of his daughter; and with this view accompanied her to Milan when she was in her fourteenth year, and afterwards sent her to Rome, where she soon acquired considerable reputation. Invited to England, she accompanied the lady of the British ambassador at Venice to that country, and met with a most flattering reception from persons of the first rank; but an unfortunate marriage with the servant of a German count, who contrived to personate his master, and even carried the deception so far as to be introduced at court, threw a cloud over her prospects; and it was only by a pecuniary bribe that she was relieved from being the duped companion of the false count. Kauffman afterwards became the wife of Signor Zucchi, an Italian painter; and after a residence of 17 years in England, she returned with him to her native country. The last years of her life were spent at Rome, where her house was the favourite resort of artists and men of kindred genius. She died in 1807, when she had reached the 67th year of her age. The respect paid to her memory was strongly marked by the numerous train of friends and admirers which attended her mortal remains to the grave.

KASAN, or CASAN, the capital of the government of the same name in Russia, stands on the banks of a river which falls into the Volga, is 400 miles east from Moscow, and nearly 700 miles south-east from Petersburgh, and is the see of an archbishop. The town is built of wood, is defended by a strong fort, and has several suburbs attached to it, one of which is occupied by Tartars. Among the public buildings are enumerated several churches and many convents; and schools are established for the education of the children of the Tartars. The principal manufactures are Russia leather and woollen cloth, which is employed for clothing to the soldiers. The fertile soil of the surrounding territory affords fine crops of wheat, barley, and oats; and extensive forests, at no great distance, furnish excellent oak timber, which is transported to Petersburgh for the purposes of ship-building.

KEATE, George, an elegant English writer, was born in 1730, appears to have resided a good deal in Switzerland, and seems to have been upon an intimate footing with the celebrated Voltaire; for his account of the History, Government, and Laws of Geneva, as well as a poetical epistle, is dedicated to that eccentric poet. Mr Keate became a student in the Inner Temple, and was called to the bar, but did not follow out the practice of the law as a profession; and perhaps his patrimonial income, which was sufficiently ample, was equal to his wishes. Mr Keate appeared as a poet in 1762, in an Epistle to Lady Jane Grey,—beside which he brought forward, in the course of his life, The Alps, Netley Abbey, The Temple Student, A Monument in Arcadia, a dramatic poem, and the Distressed Poet, a serio-comic poem. But he is perhaps more entitled to commendation in his literary character as the author of the Account of the Pelew islands, drawn up from the notes of Captain Wilson of the Antelope packet, and for the benefit of that gentleman, who, in consequence of his shipwreck on these islands, was deprived of his employment in the service of the East India Company. The account of the Pelew islands is an elegant composition; but although it is probable that the shipwrecked mariners experienced great kindness and hospitality from the native islanders, yet the amiable and disinterested part of their manners seems somewhat highly coloured. This benevolent undertaking, it is understood, brought Captain Wilson the handsome sum of nine hundred guineas. Mr Keate died in 1797.

KEILL, John, a celebrated mathematician and natural philosopher, was born at Edinburgh in 1671; having completed his studies in the university of that city, he went to Oxford in 1694; and being admitted a member of Baliol college, he commenced a course of private lectures according to the Newtonian system, and thus acquired considerable reputation in that university. In 1700 he was appointed Sedleian professor of natural philosophy. In the succeeding year he published his Introduction to Natural Philosophy, which was long employed as a text-book to courses of lectures on that subject. Previously to this time he had published an examination of Burnett's Theory of the Earth, with remarks on Whiston's Theory; and in a paper on the Laws of Attraction, presented to the Royal Society, and published in the Transactions of that body, he strenuously defends the claim of Sir Isaac Newton to the honour of the first invention of the method of fluxions. In 1709, Mr Keill visited New England as treasurer of the Palatines; and on his return, next year, was chosen Savilian professor of astronomy at Oxford. In 1711, he was appointed decipherer to Queen Anne, and held the same situation under her successor George I. The degree of doctor of physic was conferred on him by the university of which he was a member. He died in 1721. Besides the works already mentioned, Dr Keill was the author of an Introduction to Astronomy, originally in Latin, and translated by himself,—an edition of Euclid,—and some Memoirs in the Philosophical Transactions.

KEILL, James, a physician and brother of the former, was born in 1673; and having completed his academical studies, he was occupied some years in travelling abroad. He read lectures on anatomy at Oxford and Cambridge, and finally settled as a physician at Northampton, where he died in 1719. He was the author of a Translation of Lemery's Chemistry; of an Account of Animal Secretion; the Quantity of Blood in the Human Body; of a Treatise on Anatomy; and of some papers in the Philosophical Transactions.

KELP is the saline matter which is obtained by burning sea-weed, and is chiefly employed in the manufacture of soap and bottle-glass. Different species of fucus are used for this purpose, and some attention is even paid to cultivate or encourage the growth of those species which seem most productive. The manufacture of kelp has been long an object of great importance to the proprietors and tenants of the Orkney and Shetland islands, the Western islands of Scotland, and some parts of the coast of Ireland. The process of making kelp, as it is generally practised, is extremely rude and imperfect. Sea-weed, as it is thrown on shore, or cut from the rocks at low-water, is collected together, and dried on the beach; a cavity is then made in the ground of three or four feet wide, and encircled with a row of loose stones; the dry sea-weed is placed in the hollow and set fire to, and fresh quantities are added till the whole mass is in a state of fusion, and brought to a uniform consistence. When it cools, it consolidates into a heavy bluish-white substance, composed of very heterogeneous matters. Such is the impurity of the kelp of commerce, that not more than two pounds of soda are obtained from 100 pounds of crude kelp. Beside siliceous matter, the other ingredients that enter into the composition of kelp are common salt and salts of magnesia and of lime.

The improvements that have been proposed in the manufacture of kelp are in the construction of furnaces, in which it might be contrived that no part of the produce might be dissipated, and that it might be kept free from foreign ingredients during the combustion. It would also be a valuable improvement to protect the sea-weed from the rain during the process of drying, for otherwise it is injured in its quality; and it appears from experience and observation, that at two or three years old it affords a greater produce of kelp than when it is allowed to remain longer.

KELSO, a town of Roxburghshire, in Scotland, occupies a pleasant situation on the north bank of the Tweed, at its confluence with the Teviot; is a place of great antiquity, as appears from the magnificent ruins of the abbey; contains about 4000 inhabitants, and is remarkable for the fine scenery in its vicinity, and especially Fleurs, the noble residence of the duke of Roxburgh.

KEMPIS, Thomas A', a learned regular canon, who became famous by the popularity of his devotional tracts, was born at the village of Kemp in the diocese of Cologne in 1380. His sirname, it is obvious, is derived from his native village. He was educated at Deventer, and soon distinguished himself by his exemplary manners, warm piety, and the attachment which he shewed for a contemplative life. Being admitted into the monastery of Mount Saint Agnes, in the vicinity of Zwol, of which his elder brother was at that time prior, he received the habit of the order after a probation of more than six years, and was afterwards ordained priest. The remainder of his long life, which terminated in 1471, when he had entered on the 92d year of his age, was spent in the assiduous practice of the prescribed duties of the cloister, in copying the Bible, and in composing sermons, devotional treatises, and lives of holy men. But he acquired the greatest reputation by his treatise *De Imitatione Christi*,—of the Imitation of Christ; a work which has been more frequently printed than any other book excepting the Scriptures, and has been translated not only into almost every European language, but also into the Arabic and Turkish languages. The best English version is that of Dr Stanhope, first printed in 1696. But this production has been ascribed to another author, John Gersen, a Benedictine abbot, who lived before the time of Thomas a'Kempis, and it continued long to be the subject of controversy among the learned. A history of this dispute is given in a dissertation by Dupin.

KENDAL, a town of Westmoreland in England, stands in a pleasant valley on the west side of the river Ken; consists of two spacious streets; contains more than 7000 inhabitants, many of whom are engaged in the manufacture of coarse woollen cloths, knitted woollen stockings, in the spinning of cotton, and the weaving of muslin; and the ruins of a castle, on an eminence near the town, still remain.

KENNET, Basil, the author of a well known work, the Antiquities of Rome, was born in 1674 at his father's vicarage in Kent, and, being destined for the church, pursued his academical studies at Oxford; and having taken the degree of Master of Arts in 1696, he published in the same year *Romæ Antiquæ Notitia*, or the Antiquities of Rome, to which were prefixed two Essays on Roman Learning and Education. The success of this work induced the author to publish in the following year the Lives and Characters of the Ancient Greek Poets. At the same time he was elected a fellow of his college, and entered into orders; and, in prosecution of his theological studies, he drew up and published an Exposition of the Apostles Creed, according to Bishop Pearson; and an Essay towards a Paraphrase of the Psalms in verse; with a Paraphrase on the Third Chapter of the Revelations.

Mr Kennet remained several years in the capacity of chaplain to the English factory at Leghorn, returned to Oxford in 1713, and in the succeeding year was elected president of his college, and created doctor of divinity. But his health was in a declining state, and he died in 1714. A posthumous volume of sermons appeared in 1715.

The elder brother of Mr Kennet was a learned prelate, and was greatly distinguished for his knowledge of English history and antiquities, as well as for his diligence and application throughout the whole of his life. After he was promoted to the see of Peterborough, which happened in 1718, he published a Register and Chronicle of the Ecclesiastical and Civil Affairs of Charles II. He died in 1720.—*General Biography.*

KENNICOTT, Benjamin, a learned English divine and eminent Oriental scholar, was a native of Devonshire, and was born in 1718. His father was parish-clerk of the town of Totness, and was formerly master of the charity school in the same place. To this humble employment young Kennicott succeeded at an early age, and was drawn from his retirement in consequence of some verses which he addressed to the honourable Mrs Courtney, on her recovery from a dangerous illness. By that lady, and some of the neighbouring clergy and gentry, a subscription was opened to enable the author to have the advantage of an academical education. With this patronage, in 1744 he was admitted a scholar of Wadham college, Oxford, and soon distinguished himself by his progress in Oriental literature. His first productions were two dissertations; the first "On the Tree of Life in Paradise, with some Observations on the Creation and Fall of Man;" and the second "On the Oblation of Cain and Abel." The talents of the author, displayed in these dissertations, procured to him from the university literary honours before the usual prescribed period, and in a short time afterwards a fellowship of Exeter college.

Having entered into orders, Mr Kennicott supported the reputation he acquired, by the publication of occasional sermons, in some of which his critical skill in the knowledge of the original language of the Scriptures was eminently conspicuous; and, in the year 1753, the publication of "The State of the Hebrew text of the Old Testament considered, a Dissertation, in Two Parts," became the foundation of his great work. The object of this dissertation was to set aside the notion which had long prevailed among divines, that the copies of the Hebrew text of the Old Testament had been preserved absolutely pure and uncorrupted. For several years Mr Kennicott was employed in the examination of Hebrew manuscripts; and in 1760 he published his "State of the printed Hebrew Text of the Old Testament considered, Dissertation the Second." He next published Proposals for Collating all the Hebrew Manuscripts, prior to the invention of printing, that could be found in Great Britain and Ireland, and for procuring at the same time as many collations of foreign manuscripts of note as the circumstances and encouragement he should receive would permit. In this laudable undertaking he was supported by a subscription among all ranks of different nations and of different religious persuasions. He devoted his powers to finish this arduous task, corresponded with the first scholars in Europe, availed himself of learned assistance in collating manuscripts in foreign countries, and occasionally presented his patrons with an account of his progress. The amount of money received the first year, was about 500 guineas; in the succeeding year it rose to 900 guineas, and continued stationary at that sum till the tenth year, when it was equal to 1000 guineas. While the learned author was proceeding in this work, he was appointed keeper of the Radcliffe library, admitted to the degree of Doctor of Divinity, presented to a valuable living in Cornwall, and promoted to a canonry of Christ Church, Oxford. But, at an earlier period of his life, he had held the vicarage of Culham in Oxfordshire, and was one of the king's preachers at Whitehall.

The first volume of Dr Kennicott's beautiful edition of the Hebrew Bible, in folio, was published in 1766; and the second, which completed the work, appeared in 1780. A full history of the nature of the design, and of the benefits which it holds out, is given in a general dissertation prefixed to the whole. This edition, it is admitted by those who are best able to estimate its value, will contribute to the clearing up of many difficulties that have perplexed commentators, and will prove an important preparation for a new public translation of the Bible, or, at least, a full revision of the common version. The various readings which are inserted in this grand work, are the result of a collation of more than 600 manuscripts; and when the time and labour requisite for such an undertaking are considered, together with the manner in which it is executed, it must be acknowledged to reflect the greatest credit on the integrity, diligence, judgment, and learning of the editor, and to place him in the highest rank among biblical scholars, while such a work reflects honour on the country in which so noble and important a design was first patronised and carried into execution.

After a lingering illness, Dr Kennicott died at Oxford in 1783, when he had reached the 65th year of his age, and, in private life, left behind him the character of a liberal, worthy, and friendly man. At the time of his death, he was employed in preparing for the press "Remarks on Select Passages in the Old Testament," part of which was only completed. It was published in 1787, along with some imperfect sketches found among his papers, and eight sermons. *General Biography.*

KENSINGTON, a village near London, which may be considered as part of its suburbs, is chiefly remarkable for the palace and extensive gardens, which render it a place of great resort for the inhabitants of the metropolis. The population of the parish is about 11,000.

KENT, one of the maritime counties of England, forming the south-east corner of Britain. It is bounded on the north by the river Thames and its estuary which separate it from Essex, on the east and south-east by the strait of Dover with part of the North sea and English channel, on the south by the same channel and part of Sussex, and on the west by Surrey. It is about 63 miles long from west to east, and about 40 miles broad measuring along its eastern border, and is computed to contain about 894,000 acres. Thus, it is one of the largest of the English counties; and, from its extent of coast, comprehending nearly 163 miles, its vicinity to the metropolis, its beauty and fertility, and its celebrity in the annals of the kingdom, is inferior to none in interest and importance.

Its *general aspect* is highly pleasing and picturesque, and, in some parts, bold and romantic. Tracing the coast from Deptford, within three miles of London, to Lydd, near the borders of Sussex, the principal objects worthy of remark are, the towns of Woolwich, Greenwich, and Gravesend; the isle of Graine, opposite the Nore; the isle of Shepey, separated from the mainland by the river Medway and the Swale; and the North Foreland, the most eastern point of Britain. On the east are the Downs, an excellent road-stead, and, within five miles on the east, the Goodwin sands, the South Foreland forming the southern boundary of the Downs, with the towns of Sandwich, Deal, and Dover between those headlands, each of which is surmounted with one or two light-houses. Along the south part of the coast are observed the towns of Folkstone, Hythe, and New Romney, and the point called Dungeness. The north-coast is in general low and marshy; the east rises into lofty cliffs between Margate and Ramsgate and at Dover, but is low and sandy about Sandwich and Deal; the south-east is bold and steep, and the south low and marshy. In its general form, Kent resembles an irregular square or trapezium. The interior of the county is varied by hill and dale; it is flat and richly cultivated in the north-east or isle of Thanet and in the south or Romney-marsh, beautifully picturesque on the borders of Surrey, and hilly in the middle. The whole county is well watered, and several districts, especially the Weald to the north of Romney-marsh, the country between Rochester and Dover, the neighbourhood of Folkstone, and what are called the upland farms, are well clothed with wood.

Hills.—Two principal ranges of hills traverse the county from east to west, at the distance of about eight miles from each other. The most northerly range is composed almost entirely of chalk mixed with flints, and forms the southern boundary of the marshy land along the Thames. The south range is also of a calcareous nature, consisting, for the most, of *rag-stone* mixed with iron-stone.

Rivers.—Besides the Thames, which, flowing between Kent and Essex, may be regarded as belonging to both counties, the former has two or three rivers and several small streams peculiar to itself. The Thames begins to form the boundary of the county at Deptford, and in its course divides on the south, so as to form the isle of Graine, and a narrow channel between it and the main land, called the *Scray*, receiving in its course the small streams of the Cray and the Darent. It passes Woolwich and Greenwich to Gravesend, above which it widens into an estuary, part of which is called the *Nore*. The Medway has several sources, but only one or two in Kent, the principal at Baggenheath. At Tunbridge it is a single stream, but soon divides, and unites again as it approaches Yalding. Hence it flows in a winding course to Maidstone, Rochester, and Chatham, a little below which it joins the Swale, a broad and deep channel, forming an excellent road-stead for large ships between the main-land and the isle of Shepey; but the northern and western part of the channel, as far as Sheerness, is considered the mouth of the Medway, there uniting with the Thames. The river from Sheerness to Chatham is navigable for ships of any burden; and between Rochester and Maidstone, and thence to Tunbridge, for vessels not exceeding fifty tons; and in that part of its course it is bold and rapid, and its banks display rich and beautiful scenery. Two small rivers, named Greater and Lesser Stour, unite their streams near Ashford, and flow in one channel to Canterbury, a little above which they again separate, but unite just below that city, and, after forming three little islands, pass to the north-east, and contribute to divide the isle of Thanet from the rest of the county on the south, while the Wantsum rivulet separates it on the west.

Canal.—No natural lakes occur in Kent, and it contains only one canal, called the Military canal, constructed between Sandgate and the county of Sussex, for conveying military stores.

The *soil* of Kent consists in general of clay or loam of various qualities, or it is of a mixed nature, composed of clay, chalk, loam, and sand or gravel. The clay soils prevail in Romney-marsh, the isle of Shepey, and about Deal and Dover. In the first district they are soft, and easily worked, in the rest stiff and tenacious. The soil of the Weald is also chiefly clay. Loamy soils occur chiefly in part of Romney-marsh, where they are rich and deep, about Maidstone, Canterbury, Faversham, Sandwich, and Deal, where the soil is also rich but sandy; and a lighter but sufficiently fertile loam distinguishes the isle of Thanet. The mixed soil is found chiefly in the upland farms. The prevailing sub-soil throughout the county is chalk or limestone.

The *climate* is in general delightful, the air dry, serene, and temperate; but in spring and winter when the north-east winds prevail, the weather is severe, and the air piercing. At other times the wind blows more frequently from the south-west than any other point. The average quantity of rain that falls in a year on the east coast is about 27 inches. Except in Romney-marsh and Shepey isle, where, from the wetness of the soil, intermittent fevers, cholera, and dysentery are common, Kent is one of the healthiest counties in England.

Productions.—The natural productions of this county resemble, in most cases, those of the adjoining counties; but some peculiarities deserve notice. The principal minerals are chalk, ragstone, marl, flint, gravel, sand, ironstone, pyrites, and various fossils. Chalk is found in the eastern cliffs, especially at Dover and Broadstairs, in the northern ridge of hills, and in certain pits, as at Northfleet and Greenhithe, near the Thames, and in the parish of Charlton. Some of these pits are from 100 to 150 feet deep, and yield abundance of chalk, which is either burned to lime on the spot or exported to other counties. Ragstone, obtained chiefly from the southern hills and about Maidstone, is also made into lime, which forms good stucco work, and it is employed in making troughs, grave-stones, and in rough building. Cannon balls have been made of it. Marl, mixed with various fossils, occurs in some of the chalk-pits, especially at the west end of Hangury wood in Charlton parish. Flint is found in the beds of chalk, and is partly employed in building, but much of it is exported. Pieces of various grotesque figures, bearing a distant resemblance to animals and fruit, are often collected by virtuosos, and placed as ornaments on their chimney pieces. Gravel of excellent quality, fit for garden walks and park roads, is dug from pits in the vicinity of Woolwich; and sand is obtained from the same situations. Pyrites is found in great abundance in the cliffs of Shepey isle, and manufactured into green copperas. The iron-stone of the southern hills is sufficiently rich in metal to be smelted, but the iron thus obtained is fit only for casting. Numerous organic remains, both animal and vegetable, consisting chiefly of shells, among which are some fine *cornua ammonis*, of echini, teeth of sharks, tusks and teeth of elephants, skeletons of tortoises, petrified wood and fruits, are met with in the chalk and gravel pits.

Two mineral springs are found in Kent,—the celebrated chalybeate water of Tunbridge Wells, to be afterwards particularly noticed, and a spring near Dulwich, the water of which is impregnated with sulphate of magnesia.

About 300 species of plants have been enumerated as Kentish, though only a few are rare. Among these, eryngo and samphire may be noticed as growing on Dover cliff. Fennel is a common weed in the isle of Thanet.

Most of the common wild quadrupeds of Britain are found in Kent, and of the birds the rarest are the Cornish chough, the turtle-dove, and the Dartford warbler. Salmon and sturgeon are still occasionally taken in the Medway, and sprats are common in the mouth of the Thames; lobsters, small, but of excellent flavour, and shrimps and prawns in abundance, are caught off the east coast; and the celebrated Milton oysters, with others of good quality, dredged in the Swale, and near Faversham, form great part of the supply furnished to the London fishmongers. Some curious insects, as the stag-beetle and the harvest-bug, are more common there than in most other counties.

The total *population* of Kent is stated to amount to about 386,000, of which number a large proportion consists of females. More than one-third of the inhabitants are employed in agriculture, and nearly as many in arts, manufactures, and trade. By the census of 1811, it appeared, that about 62,100 houses were inhabited by about 72,300 families. Compared with its extent, Kent is one of the most populous counties in England, averaging about 263 persons in each square mile.

Agriculture.—No subject connected with Kent merits a fuller discussion than its agriculture, which has long been conducted in a state of excellence not to be exceeded in Britain. The variety and value of its crops, and the neatness in which the fields are kept, have often drawn forth the eulogiums of both agricultural and general travellers. The country round Deptford and Gravesend is a perfect garden; and the isle of Thanet resembles rather an assemblage of gardens than a district of farms; while the extensive hop-grounds about Maidstone and Canterbury, the fruit-orchards in the vicinity of the former town, the woodlands of the Weald, and the exuberant verdure of Romney-marsh, combine to impress the mind of the beholder with the most exalted ideas of the richness, fertility, and management of the county. The greater part of Kent, including most of the isle of Thanet and of East Kent, and the environs of Canterbury, Maidstone, Faversham, Deal, and Sandwich, with parts of Romney-marsh and Shepey isle, consist of arable land; the rest of Romney-marsh, and most of Shepey, are laid out in pastures. The principal crops are, wheat, barley, oats, potatoes, beans, and tares; canary, mustard, spinach, and radish-seeds for the London seedsmen; hops, turnips, and cabbages for cattle; clover and saintfoin, both for summer-fodder and for hay; cherries, apples, filberds, green-peas, and other fruit and vegetables for the London markets. Of the wood grown for timber and domestic purposes, oak and beech are produced on the dry soils, and on the same situations great quantities of birch, which is consumed chiefly in making brooms; and on the chalk and other lighter soils, ash, willow, and hazel, are the prevailing trees.

The wheat is of excellent quality, nearly equal to what is grown in Essex. The best kind, called white or egg-shell wheat, is produced on rich sandy loam, and often yields five quarters the acre;—the average produce of the county is stated at about 22 bushels. It is commonly sown in November, and reaped in the beginning of August. The best barley is grown in the isle of Thanet. It is sown in spring, and reaped between July and September, and yields from 25 bushels to seven quarters the acre. Beans and peas are planted in great quantities in the spring, and when gathered in autumn usually produce from two to six quarters the acre of the former, and from 1¼ to five of the latter. Potatoes form a general crop throughout the county, chiefly for home consumption. The cultivation of canary and garden-seeds is carried on to a great extent, especially in the isle of Thanet for the first and for kidney-beans. The best hops are produced round Canterbury and Sandwich. In the vicinity of the former, about 3000 acres are usually laid down in this crop. The produce is sometimes so abundant, that 45 cwt. valued at L.145, have been gathered from half an acre. Turnips are less generally, and, on the whole, less successfully cultivated than in some of the neighbouring counties; clover nearly to the same extent, and in the same manner as in Essex. Saintfoin is very common on the light soil above chalk, especially in the isle of Thanet, where it makes a beautiful appearance when in flower. The oak grown on the wood lands is fit for shipbuilding, and the beech affords excellent timber for the carpenter and cabinet-maker; but most of the ash and willow is converted into hop-poles.

The meadow-lands fit for producing hay are not extensive; but, besides Romney-marsh and Shepey, good pasture ground for sheep and cattle occurs in the marshy part of Thanet,—in the upland farms,—and on the banks of the Medway and the Thames. The cattle are of various breeds, according to the district. The best sheep are bred on Romney-marsh; and a peculiar breed of horses, rather smaller than what are seen in the rest of the county, is reared in Shepey. Both butter and cheese are made, but Kent is not a dairy county.

The arable farms are in general small, sometimes not exceeding 10 or 15 acres, but some of the grazing farms contain from 300 to 600 acres. The freeholds are very numerous, amounting to above 9000. The excellence of the Kentish husbandry depends partly on the natural fertility of the soil, or the means used for improving it; partly on the great number of hands employed at once in hoeing, weeding, and getting in the crops; and, in a great measure, on the great power and peculiar structure of the Kentish plough. Paring, burning, and draining, are generally practised where such operations are required; and, among the manures, cockle-shells and sea-weed are used on the coast-lands. The plough just mentioned, called the turn-wrest plough, is very strong and heavy, with a powerful share of hammered iron, goes on wheels, and is drawn by four, sometimes by six horses. It is adapted chiefly to the stiff and gravelly soil, and is constructed so as to turn up the ground without leaving furrows.

Gavel-kind.—The smallness of the farms, and the number of freeholds, are owing principally to the custom which prevails in this county with respect to the mode of succession, and which is called *gavel-kind.* By this custom, when a person dies, his possessions are divided equally among his sons, or, should he survive them, his grandsons; if he have no male-issue, among his daughters or grand-daughters. In the same manner, where a person dies without children, his property descends among his brothers, his nephews, or his nieces. By the same custom, a widow is entitled to the enjoyment of one-half of the husband's property during her widowhood. In cases of treason, or by act of parliament, with regard to particular estates, the law of gavelkind is set aside; but, in general, it is presumed to regulate the succession till the contrary be proved.

Manufactures and commerce.—The manufactures are few, and of no great importance. Lime is made in considerable quantity in most of the chalk-districts. Copperas is manufactured to a considerable extent at Woolwich, Deptford, and Whitstable, salt in the isle of Graine and about Sandwich. Some iron-works are established in the Weald. Silk is manufactured at Canterbury and Sevenoaks; and cotton-mills, print-works, and bleachfields are established in several parts of the county, especially at Craigford. Thread is made at Maidstone, and paper at the same place, and at Boxley, Dover, and Dartford. The manufacture of hop-bags is one of the most common; and Sevenoaks is celebrated for its excellent cricket-bats. Commerce is confined chiefly to the coasting-trade, and the conveyance of the produce of the county to London, in exchange for wine and groceries. The principal exports consist of chalk, lime, flint, much of which last is transmitted to China for the porcelain manufacture; of grain, hops, canary and garden-seeds, birch for brooms, oysters, and Tunbridge-ware; and the chief imports are, coals from Sunderland, and iron, hemp, tar, deals, and other materials for ship-building, from the Baltic.

Ecclesiastical state and representation.—The metropolitan see of Canterbury, to which are attached eleven deaneries, and the bishopric of Rochester with four deaneries, render Kent the most eminent county with regard to its ecclesiastical state. It is represented in parliament by eighteen members, two for the county, two for each of its cities, Canterbury and Rochester, and two for each of the following towns, Maidstone, Dover, Sandwich, Queenborough, Hythe, and New Romney. A court of sessions is held four times a-year both in East and West Kent; and the justices of these two divisions generally act independently of those of the other.

Eminent persons.—Among the distinguished characters to which Kent has given birth, or who have honoured that county with their ordinary residence, may be mentioned, Queen Elizabeth and her secretary Walsingham, General Wolfe, Lardner the celebrated divine, Caxton the introducer of printing into England, Kennet the learned antiquary, Archbishop Tillotson, Bishop Hoadley, the patriotic Yorke earl of Hardwicke, Mr Day author of Sandford and Merton, and Mrs Elizabeth Carter.

The *antiquities* of Kent are extremely numerous, and are found in almost every part of the county. They belong to various periods; but the Roman, Danish, Saxon, and Norman are the most common. The Roman remains consist chiefly of coins, medals, urns, vases, tiles, bricks, *paterae*, and other pieces of pottery, both broken and entire; but arches, pavements, and even parts of buildings, are occasionally seen, as at Canterbury, Richborough, and Dover. Part of a circular amphitheatre remains at Richborough, and a remarkable *pharos*, in good preservation, is still seen on the castle-hill at Dover. The Danish antiquities are but few, and are principally barrows and entrenchments, especially one of the latter in Kipple parish, near Walmer. A remarkable mount near Canterbury, called Dane-john, is also supposed to be of Danish origin. Of Saxon and Norman antiquities, numerous instances occur in the ruins of religious buildings, forts, and castles, especially the abbey and gate of St Augustine, the abbey church, and the castle at Canterbury, and the priory at Tunbridge.

The history of Kent is so intimately connected with that of the kingdom in general, that, to relate the numerous events which have taken place in the county, would be repeating what has already been given under BRITAIN.

Divisions.—The whole county is divided into East and West Kent, and into five districts called *lathes*, and denominated Augustine, Aylesford, Seray, Shepway, and Sutton-at-hone. It comprehends 15 liberties, 63 hundreds, 414 parishes, and contains two cities, and about 22 market or principal towns; namely, *Canterbury*, *Rochester*, *Dover*, Greenwich, Chatham, *Maidstone*, *Sandwich*, Deal, Faversham, *Romney*, *Hythe*, *Queenborough*, Deptford, Woolwich, Sheerness, Margate, Ramsgate, Tunbridge, Gravesend, Folkstone, Dartford, and Sevenoaks. Those marked in italics are boroughs.

Canterbury is situated in a valley between and upon the branches of the Stour, in the midst of hop-grounds and plantations. Though the capital of the county, and the seat of an archbishopric, and inhabited by many genteel families, it is not a very large place, containing about 13,000 inhabitants, many of whom are employed in the adjacent hop-grounds. The streets are well paved and lighted, but the houses are in general humble, if not mean. It was once surrounded with a wall, part of which still remains, and had several gates, though only one, called the West gate, is now standing. The principal public buildings are,—the cathedral, a large and magnificent edifice, highly decorated, and containing many handsome monuments of monarchs, prelates, and other distinguished characters, particularly of Thomas-à-Becket; eleven other churches within the walls, and three in the suburbs; the Kent and Canterbury hospital; the town-hall; the gaol; the assembly-rooms, with a bank below them; and the theatre. There are also extensive barracks, many hospitals and other charitable institutions, two libraries, and one of the largest flour-mills in the kingdom, capable of grinding 500 quarters of corn in the week. The manufactory of silk, established by the Walloons, is now nearly superseded by that of cotton goods and Chamberry muslins. Canterbury is a place of great antiquity, and is the *Durovernum* of the Romans. It abounds with Roman, Saxon, and Norman antiquities; and through it passed the famous Roman road commonly called Watling Street. It is about 57 miles from London, and stands in 51° 18′ N. latitude, and 55′ E. longitude.

Rochester is built on the banks of the Medway, over which is an ancient stone bridge, and there is a commodious wharf below the town for loading and unloading vessels. It is a small but handsome city; the houses are respectable and well built, and the streets clean and well paved; and the High street, forming part of the great road from London to Canterbury, is sufficiently spacious. The principal buildings are,—the cathedral, which, though less magnificent than that of Canterbury, is large and interesting, and exhibits specimens of several kinds of architecture; two churches, dedicated to St Nicholas and St Margaret; an ancient castle, in good preservation; St Catherine's hospital; a free-school, a grammar school, and alms-house; the record-room at one end of the bridge, a town-hall, and a clock-house. The city contains about 7000 inhabitants, employed chiefly in trade and commerce, and it has several large and convenient inns. Rochester was also a Roman station, and was called *Durobrivis*.

Dover, the chief sea-port of Kent, and one of the Cinque-ports, stands in a romantic valley nearly environed by chalk hills and lofty cliffs. It is a large and handsome town, consisting chiefly of three long streets, which meet nearly at a point at one extremity. It contains two churches, one of which, St Mary's, is an old and spacious edifice, a handsome custom-house, a commodious military hospital, a town-hall, a neat assembly-room, a theatre, and two circulating libraries. The castle, situated on the summit of Dover cliff, is one of the strongest and best appointed fortifications in the kingdom. It is of great antiquity, is strengthened with numerous towers besides outworks, and is well provided with artillery. Among the guns is shewn a very long brass piece, called Queen Elizabeth's pocket-piece, which is said to carry a ball nearly across Dover strait. The harbour of Dover is large and commodious, well defended by piers and jetties, and admits vessels of 500 tons burden, but is liable to be obstructed during a south-east wind by sand,—an inconvenience that is easily removed by the sluices and back-water lately erected. Dover is the principal port of communication between England and France, and being well situated for bathing is much frequented for that purpose during the summer. The population of the town is about 10,000, but including the liberty it is supposed to exceed 15,000.

Greenwich, on the south bank of the Thames, about six miles from London, is a neat and populous market-town, forming one of the most delightful objects in passing up or down the river; including the seamen lodged within its precincts, contains nearly 17,000 inhabitants, but celebrated chiefly for its naval hospital and observatory. Greenwich hospital, the great and noble asylum for decayed British seamen, is in every respect a princely edifice. It is built immediately on the south bank of the Thames, and is formed by the wing of a palace erected for the temporary residence of Charles II., but chiefly by additions made during the reigns of William and Mary and Queen Anne. It is composed of four quadrangles, and, besides splendid apartments for the meetings of the commissioners, and handsome rooms for lodging the various officers of the establishment, a chapel, infirmary, and other buildings, it contains ample accommodation for about 2500 pensioners. The Royal Observatory, from the site of which the longitude is reckoned in this country, is a plain brick building, erected on an eminence in Greenwich park. It contains commodious apartments for the astronomer-royal and his assistants, and is provided with an excellent collection of astronomical instruments. The parish church of Greenwich is a handsome stone edifice, of modern structure; and, beside the building already mentioned, the town contains hospitals and schools for the relief and education of the poor, and some good boarding-schools.

Chatham, though nearly contiguous to Rochester, is a distinct town, seated on the Medway, and of great importance for its extensive dock-yard and the accommodation which it affords for shipping of the largest size. The dock-yard is one of the most complete in the kingdom, and contains numerous warehouses and other buildings fitted for equipping men of war of the largest size in the course of a few weeks; especially a store-house, a mast-house, with ponds for floating large timber, a rope-house, where cables of the greatest calibre are manufactured, numerous forges where anchors of five tons weight are made, and many offices for accommodating the persons employed in the superintendance of the dock-yard. Contiguous to the dock-yard is an extensive ordnance wharf, well supplied with artillery and ammunition. Chatham consists of one principal street, and has several handsome houses. It has one parish church, and a chapel of ease. The streets are irregular and not well paved. Exclusive of the soldiery, who are accommodated in handsome barracks, the town contains about 11,000 inhabitants, employed chiefly in commercial and maritime concerns.

Maidstone, the county town though not the capital of Kent, is situated on the Medway about eight miles above Rochester, is a handsome town, consisting of four principal streets which meet in the market-place, and is the centre of the hop trade. It has a bridge of several arches over the Medway, and is surrounded with hop plantations and fruit orchards. The chief buildings are, the church, which is the largest in the county, the county jail, and the court hall where the general assizes are held. The population amounts to about 10,000.—*Sandwich*, one of the Cinque-ports, stands on a low flat at the mouth of the Stour, which forms its haven. It contains about 7000 inhabitants; and though, from the shallowness of the harbour, it be a much less flourishing port than formerly, still carries on a respectable commerce with London and the Baltic.—*Deal* is now a more important town than Sandwich, from its situation close to the sea coast opposite the Downs, and its continual intercourse with the shipping that resort thither. It consists of three principal streets running parallel to the coast, and contains some good houses and several respectable public buildings, especially the castle, custom-house, naval store-house, naval hospital, military barracks, and chapel of ease. The parish church stands without the town. The population amounts to about 8000, employed chiefly in maritime affairs, and above 60 pilots reside there for navigating ships to and from the Downs, and up the Thames to Medway. Deal is well defended by batteries and martillo towers erected along the shore.—*Faversham* is a neat market and trading town, built on a small navigable river which communicates with the Swale. It consists of four principal streets crossing each other, is well paved and lighted, and, including the out-liberty, contains about 4000 inhabitants, most of whom are employed in trade and manufactures. The principal buildings are, a large and handsome church, a guild-hall or market-house, and a grammar school. An extensive manufactory of gunpowder belonging to government is carried on, and the town has a considerable trade with London and some of the coast towns, and is the chief centre of the oyster fishery.—*New Romney* now stands at a little distance from the coast of the English channel, and though formerly reckoned among the Cinque-ports, has long ceased to be a maritime town. It is a borough by prescription, contains a handsome church partly of Norman architecture, a town-hall or brotherhood-house, and above 2000 inhabitants. *Hythe*, one of the Cinque-ports, and situated near Romney, consists chiefly of a long street running parallel to the beach; it contains a large church, a court hall, and theatre, and is inhabited by between 2000 and 3000 persons, employed principally in trade.

Queenborough, on the isle of Shepey, though a neat borough town, is very insignificant, and contains scarcely more than 500 inhabitants employed in fishing and oyster-dredging. In this town is a remarkable well, producing a constant supply of excellent water, and supposed to be about 160 feet lower than the bottom of the adjacent rivers.

Woolwich, a royal arsenal, the chief seat of the royal artillery, and celebrated for its dock-yard, in which ships of the highest rate are built, is situated on the Thames about 10 miles below London, and, including the artificers employed in the public works, contains about 4,000 inhabitants. The dock-yard is very extensive, and the arsenal comprehends numerous buildings for casting cannons, preparing cartridges and fire-works, and other purposes connected with the ordnance department. In the neighbourhood of the town are a military school, and barracks for regiments of the line and artillery.

Deptford, a large and populous town, situated on the Thames in the vicinity of London, is remarkable for its extensive dock-yards. It is well built, and contains several handsome houses, with two churches, an hospital dedicated to the Trinity, and about 20,000 inhabitants. It is divided into the old and new towns by the small river Ravensborne, with a connecting bridge of several arches. The buildings and establishments of the dock-yards are similar to those of Chatham; and there is a large manufactory of earthen-ware.

Sheerness, on the south-western side of Shepey isle, has for some time been distinguished as one of the principal fortresses and dock-yards in the kingdom. It is also a market town, and contains some good modern houses. The population fluctuates according to the number of artificers employed in the naval yards, which, in time of war, generally exceeds 4000, but during peace is seldom above 1500. Handsome barracks have been erected for the military, and a well, similar to that of Queenborough, affords an ample supply of water to the inhabitants and garrison.

Margate, which, next to Brighton, is one of the most fashionable places of summer resort for sea-bathing, stands at the head of a bay to the west of the North Foreland. The streets are irregular, but it contains several handsome squares and elegant buildings, particularly the assembly rooms in Cecil square, the theatre in Hawley square, and several public libraries. A suite of bathing rooms, for the accommodation of the public, has been erected on the west side of the High Street close to the water's edge, and the bathing machines belonging to those rooms are clean and commodious. A sea-bathing infirmary, for the use of the poor, a charity school, for the education and maintenance of 80 children, and Draper's hospital, without the town, for the support of decayed housekeepers, constitute the chief charitable institutions. The church on the south-east of the town is an old spacious edifice, with a square tower. A handsome pier, with a parapet wall, affords convenience for the numerous hoys and other shipping belonging to the port, and also forms a favourite promenade; and to the north is a battery with a few guns. Margate contains about 6,200 inhabitants, and carries on a considerable trade with London and the coast of England.

Ramsgate is another bathing place, little inferior to Margate, situated on the east coast, a little south of the North Foreland. It has an excellent harbour, with a very strong and handsome pier. The chief buildings are the assembly rooms, the chapel of ease, and a light-house, and the population amounts to between 3000 and 4000.

Tunbridge is delightfully situated in an extensive tract on the banks of the Medway. It is a very neat town, consisting of one principal street, which is long and broad; has a bridge over the river, a handsome church, and a free grammar school, and contains about 5000 inhabitants. The wells which form the site of the mineral spring, and are resorted to by fashionable people during summer, consist of several scattered houses, about five or six miles from the town. Some handsome public buildings, especially assembly-rooms, coffee-house, and library, some good inns, and an extensive parade, with a covered portico supported by Tuscan columns, have been erected for the accommodation of visitors, and part of the water is collected into a bath. The Tunbridge water is slightly saline and chalybeate, and affords a valuable remedy against indigestion, general weakness, and other nervous complaints.

Gravesend stands on a gentle declivity fronting the Thames. The principal streets are that through which runs the high road from London, and another crossing it towards the river. The chief buildings are St George's church, the town hall, a theatre, and small chapel. A commodious wharf next the river was built in 1767; and the town is defended by two batteries, each mounting 16 guns. The town is considered as the termination of the port of London, and forms a great

Kent.

rendezvous for outward bound shipping; has a small manufactory for ropes and cables, and a yard for ship building. It contains above 3000 inhabitants, employed in trade, manufactures, and gardening.

Folkstone is built on the side of an irregular cliff, facing the English channel, and consists of three streets, rising one above another, and surmounted by the church. It has a market-house, a custom-house, a free school, and three dissenting meeting-houses, and contains about 4000 inhabitants. A battery of six great guns defends it next the sea. This town enjoys a considerable coasting trade, and is the principal seat of the Kentish fisheries. Ship-building is also carried on to a considerable extent.

Dartford, on the river Darent, near its confluence with the Thames, contains above 3000 inhabitants, and is celebrated chiefly for its extensive gun-powder manufactory.

Sevenoaks is a small neat town, consisting of two streets, and inhabited principally by genteel independent families. The population scarcely exceeds 1000.

KENT, William, celebrated for his improvements in the art of landscape-gardening, was a native of Yorkshire, was born in 1684, and was originally an apprentice to a country coach-painter; but having quitted his master without permission, he repaired to the metropolis, and soon gave such proofs of genius, that some gentlemen of his native country liberally set on foot a subscription to defray the expence of his residence in Rome for improvement. He spent several years in Italy, and, returning in 1719, was recommended by his friends as a history and portrait painter. But in these branches he seems to have attained little celebrity, and was little known, till his taste for ornamental decorations in the inside architecture and furniture of houses brought him into notice, and rendered him the oracle of fashion, so that wherever ornament could be applied he was consulted. He is entitled to admiration even in the higher department of architecture. Some of the mansions of the English nobility afford sufficient evidence of the beauty of his designs; but Holkham, the seat of the earl of Leicester, in Norfolk, is regarded as the finest effort of his genius.

In landscape-gardening, the native growth of England, Mr Kent is admitted to have created a new species of imitative art. His leading object was to form the whole extent of pleasure-grounds into a varied and natural landscape, diversified by light and shade, upon picturesque principles; and in attaining this object, he broke all the old uniformity of straight lines and corresponding parts; and formed and distributed wood, water, and ground into such shapes and situations as nature, in her most pleasing and beautiful aspect, exhibits. The improvements which Kent introduced on the grounds of Esher are alluded to in the verses of Pope:

Where Kent and Nature vied for Pelham's love.

And a similar allusion is made by the author of the Seasons to the same improvements:

Oh, vale of bliss! Oh, softly swelling hills!
On which the power of cultivation lies,
And joys to see the wonders of his toil.

Kentucky.

Mr Kent was fortunate in obtaining royal patronage, and he held the places of architect, keeper of the pictures, and principal painter to the crown. He died in 1748.

KENTUCKY, one of the United States of North America, derives its name from the river which traverses the district; is included between $36\frac{1}{2}$ and $39\frac{1}{2}$ degrees of north latitude; is about 300 miles in length from north to south, with an average breadth of 150 miles, and about 50,000 square miles of superficial extent. The river Ohio forms its boundary on the north-west side; it is separated on the east from Virginia by the Cumberland mountains; the Mississippi forms the separation on the west from Upper Louisiana, and the state of Tennessee on the south.

Excepting towards the Cumberland mountains on the south-east, the state of Kentucky presents an uneven surface, with gentle undulations; the predominant rocks are limestone, in which are very spacious caves; and some of the limestone answers the purpose of marble. The principal rivers, which either form the boundaries of the state or traverse its interior, are the Mississippi, the Ohio, the Big Sandy, the Tennessee, the Kentucky, the Green river, and the Licking. The Kentucky, after a course of 280 miles through rugged and precipitous banks, discharges its waters into the Ohio, and is navigable for part of the year; the Green river, after a westerly course of nearly 300 miles, in part of which it is navigable, also joins the Ohio; and the Licking falls into the same river, and is also partly navigable.

In many districts of the state the soil is rich and fertile; maize, barley, oats, wheat and rye, flax and hemp, cotton and tobacco, are the usual crops; and the forests furnish excellent timber trees, especially elm, beech, and ash.

Population, &c.—This district of America was little known, except to the traders among the Indians, before the middle of the 18th century. After being several times explored, the first family settled in it in 1775; two years afterwards it was erected into a separate county attached to Virginia; and in 1792 it was acknowledged as one of the United States. The population in 1790 exceeded 73,000; and in 1810 the amount was more than 400,000.

Among the manufactures of this state are enumerated cloth of linen and cotton, tanning, distilling, paper, saltpetre, maple-sugar, and iron-founderies.

Numerous caves, it has been observed, exist in the rocks of limestone. One of the most remarkable is the Mammoth cave in the Green river county, which is situated in the lower part of Kentucky. From the earth in the interior of this cave a great deal of saltpetre is manufactured. Including the numerous windings, the whole length of the cave is supposed not to be less than ten miles. In one of these caves a mummy, conjectured to be that of an Indian queen, was discovered a few years ago. The conjecture with regard to the rank of this individual is founded on the dresses, trinkets, and ornaments with which it was furnished. The body was wrapped up in two dressed deer-skins, and the whole inclosed in a coarse mat. From other parts of dress discovered in this cave, it is naturally inferred that it was a place of refuge; and, as these things are different from what are worn by any of the tribes of Indians known to Europeans, it is supposed they must have belonged to a race now extinct. Some pieces of the cloth in which the mummy was wrapped up resemble similar productions of the South sea islanders, and the mantle of cloth and feathers is similar in its form and texture to those of the chiefs of Owhyhee.

Towns.—Frankfort and Lexington are the chief towns of the state of Kentucky.—*Frankfort*, the seat of government, is situated on the east bank of the river Kentucky, and contains more than 1000 inhabitants.—*Lexington*, which is situated on a fine plain half encompassed by the river Kentucky for a course of 60 miles, contains between 4000 and 5000 inhabitants, and is the seat of some prosperous manufactures. The churches are three, the Presbyterian, the Baptist, and the Episcopalian. The college called the Transylvania university is established at Lexington, and is under the superintendance of twenty trustees, and under the immediate direction of a president and five professors. Seventy students, beside those of medicine, attend this seminary. Lexington is 30 miles distant from Frankfort. Morse's *American Geography*; Michaux's *Travels*.

KEPLER, John, a very eminent astronomer, was a native of Weil in the duchy of Wirtemberg in Germany, and was born in 1571. The misfortunes of the father, who had been an officer of distinction, and had been reduced to indigence, subjected the son to many interruptions during his early education; but the force of his genius, and his strong desire for knowledge, enabled him to surmount every difficulty, and rendered his proficiency in study truly astonishing. He prosecuted his academical course at the university of Tubingen, and obtained the degree of master of philosophy in 1591. In the succeeding year he directed his attention to the study of divinity, and the sermons which he composed exhibited sufficient proofs that he would have become conspicuous as a preacher; but mathematics became the favourite object of his pursuit; and he acquired so high a reputation on this account, that he was invited, in 1594, to the mathematical chair in the university of Gratz in Styria. From this time his studies were chiefly directed to astronomy; and numerous and of great interest were the discoveries which he made relative to the laws of the planetary motions.

Compelled for a time, on account of religious persecution, to quit Gratz, he was afterwards recalled by the states; but the calamities of war forced him again to retire and look round for an asylum where he might enjoy safety and repose. In this embarrassing state of affairs, he was urged strongly by the celebrated Tycho Brahe to settle in Bohemia as his assistant, where he himself was furnished by the liberality of the emperor Rodolph with every thing necessary for the prosecution of his astronomical studies. The assurances of protection and encouragement which Kepler received, induced him to resign his place in the university and settle in Bohemia. On his way to that country, in 1600, he was seized with an intermittent fever which harrassed him for seven or eight months, and rendered his services to Tycho Brahe of very limited extent. But, at any rate, in the connexion between the two eminent astronomers, little cordiality or friendship seems to have prevailed. Kepler appears to have thought himself neglected and treated with great reserve; but, as Tycho died in the succeeding year, their intercourse was of short duration; and thus Kepler, while his services were of little advantage, derived no great benefit from the researches of the Danish astronomer.

Kepler being introduced to the emperor was appointed mathematician to his imperial majesty, and was furnished with instructions to complete the Rodolphine Tables, which had been begun by Tycho Brahe. The occurrence of various difficulties precluded the publication of these tables till the year 1627; two years after which time Kepler made a journey to Ratisbon to claim payment of the arrears of his pension, and was seized with a severe fever, induced, it is supposed, by the fatigue of travelling; and to this distemper he fell a victim in 1630, when he had reached the 59th year of his age.

In imitation of the disciples of Pythagoras and Plato, and perhaps from frequent reflection on their principles and views, Kepler indulged a peculiar passion for finding analogies and harmonies in nature; and although he was often led to adopt strange, and even ridiculous conceits, yet, as they seem to have been steps in his progress towards important discoveries, they are entitled to some indulgence. It is said that he was so delighted with the singular and whimsical notions contained in his *Mysterium Cosmographicum*, which was published in 1596, that he declared he would not give up the honour of having invented what was contained in that book for being put in possession of the electorate of Saxony.

The true figure of the planetary orbits, and the proportions of the motions of the solar system, are the grand discoveries of this sagacious and able astronomer and mathematician. He was the first that detected the invariable mistake of astronomers in describing circular orbits and uniform motions to the planets, since each of them moves in an ellipse, having one of its foci in the sun. After numerous fruitless efforts, he was fortunate in making the fine discovery, "That the squares of the periodic times of the planets are always in the same proportion as the cubes of their mean distances from the sun." It was long a favourite opinion of Kepler, that the number of primary planets is limited to six; but the discovery of the satellites of Jupiter by Galileo completely set aside his views on this subject, and overturned the doctrines contained in the *Mysterium Cosmographicum*. At the same time his sagacity and incessant application to the study of the planetary motions led him to trace the two principles from which these motions proceed. He considered gravity as a power that is mutual between two bodies,—that the earth and moon tend towards each other, and would meet in a point so much nearer to the earth than to the moon, as the earth is greater than the moon, if their motions did not prevent it; and he ascribed the cause of the tides to the gravitation of the waters towards the moon. But as his notions of the laws of motion were not correct, he could not turn his sagacious conjectures to the best advantage. In the discoveries of Sir Isaac Newton, the prediction of Kepler, "that the discovery of the true laws of gravity was reserved for the succeeding age, when the author of nature would be pleased to reveal those mysteries," has been fully verified.

Beside his works on astronomy, for a list of which the learned reader is referred to Aikin's *General Biography*, or to Small's History of his Astronomical Discoveries, Kepler was the author of several other works connected with Chronology, the Mensuration of Solids and Trigonometry, and of a treatise of Dioptrics, esteemed a valuable performance for the time in which it was written.

KERGUELEN'S LAND, or ISLANDS of DESOLATION, a groupe of islands in the Southern Indian ocean, was discovered in 1772 by De Kerguelen, and visited by captain Cook in 1776. One of these islands is described as being very lofty, and about three leagues in circumference; another is nearly of the same size, and several of smaller magnitude are in the immediate vicinity; and although in the latitude of 49°, they all present a very barren aspect.

KERMAN, a province of Persia, which has the Persian gulph for part of its southern boundary. Part of this province is mountainous, and some of the ridges are of such a height that the snow remains undissolved during a considerable proportion of the year. The northern part is nearly desert, and destitute of rivers or brooks. Other districts of the province are covered with a fertile soil, and an abundant population. From the diversity of climate which prevails, grain, and some of the fruits of tropical regions, are produced with advantage.

Kerman, or *Serjan*, is one of the principal towns of the province, and is described as having been in former times one of the richest and most splendid cities of the kingdom; but so late as the year 1794, it experienced all the calamities of war, and having fallen into the hands of a rival chief, it was given up to the indiscriminate plunder of the soldiers. The walls and public buildings were razed to the ground, and most of the inhabitants were either massacred or banished to the remote provinces of the empire. Kerman is the residence of the governor; and, like other eastern towns, has numerous caravanseras, or lodging-houses, for the convenience of travellers. The population, part of which is composed of Armenians, Jews, and Hindoos, amounts to 20,000; and the manufacture of shawls, carpets, and matchlocks has been brought to great perfection by the inhabitants. These commodities are exported to the northern provinces in exchange for steel, copper, skins, furs, silk, and drugs.

Gombroon or *Gambron*, is a sea-port town, and was well known under Bender Abbas, during the 17th century, as the port of Schiraz and of the southern regions of Persia, when it enjoyed a very extensive trade both with eastern countries and Europe; but in consequence of domestic dissentions, and the wars and disputes between the English and French, that trade has entirely declined. The intercourse with the Dutch was at one time considerable, till they formed a settlement in the island of Karek.

Darabjerd is a town at the western extremity of the province, occupies a fine situation on the banks of a river, and in an extensive plain covered with groves of orange and lemon trees. The city was once very extensive, but great part of it is now in ruins, and the number of inhabitants is estimated between 15,000 and 20,000. The province contains several other towns, most of which are surrounded with ditches, and generally fortified with mud walls, and at the same time adorned with fine gardens.

KERMANSHAW, the capital of a district of the same name in the province of Irak in Persia, stands on a fine plain, which is traversed by the river Karasu, contains numerous public baths, several mosques, and a population exceeding 50,000, and is the residence of the eldest son of the king.

KERMES, a species of coccus, which is produced in the excrescences of a variety of the oak, and is employed in dyeing. See DYEING.

KERMES-MINERAL is a preparation of antimony, and is so called from its colour, which resembles that of the animal Kermes. See CHEMISTRY.

KERRY, a maritime county of the province of Munster in Ireland, lies on the south-west coast, and has for its boundaries on the north and east the river Shannon, and the counties of Limerick and Cork and the Atlantic ocean on the south and west. The extent from north to south is about 67 English miles, and the greatest breadth exceeds 50 miles.

The greater part of the county of Kerry is mountainous, and some of the ridges rise 3400 feet above the level of the sea, and part is covered with extensive boggy tracts. In the northern districts the soil is rich and fertile, but rugged and barren rocks are often interspersed with rich pastures and cultivated fields.

This county is watered by numerous rivers, of which the Cashing, formed of the united streams of the Feele and the Gale, and navigable for eight or ten miles, the Lane deriving its source from the lake of Killarney, the Mang, which is partly navigable, and flows into Dingle bay, and the Kenmare, which affords a safe haven, are the principal.

The rocks of the county of Kerry seem to belong to the primitive class. Marble and slate quarries have been long in a state of activity; copper and lead-ores are dug out at Killarney; in the copper mines alone, at Ross island, in the lake of Killarney, 500 men are employed.

The population of this county exceeds 107,000, of which scarcely 2000 are protestants. The landed property is divided among a few great families. The mountainous districts are devoted to pasturage, on which great numbers of the small native breed of cattle are reared. The number of sheep is said not to be great; but the horses, although small, are a strong and hardy race.

The chief towns of Kerry are, Tralee, Killarney, Milltown, and Dingle.

Tralee is the county town, and is situated near a small river which discharges itself into a spacious bay of the Atlantic, called from the town the bay of Tralee. The assizes are held at this place, and it sends one member to the Imperial Parliament.

Dingle, which is 21 miles south-west from Tralee, is a sea-port town, which stands on a large bay to which it gives name on the north coast, and was once a place of considerable trade. Butter, beef, corn, and linen, are still enumerated among its exports.

Killarney, which stands on the banks of the lake of the same name, contains 5000 inhabitants, and has many neat houses, and an excellent public school for the children of Catholics. In the immediate vicinity are the venerable ruins of Mucross abbey, surrounded with lofty trees. A yew tree of immense size rises from the centre of a cloistered court, and overshadows the roof with its spreading branches. Killarney is greatly resorted to in summer by strangers who visit the fine scenery of the lake.

The lake of Killarney, which is so much admired for its picturesque scenery, admits of a natural division into three parts, distinguished by the name of the lower, middle, and upper lakes. The length of the northern or lower lake is six miles, and the breadth from three to four miles. The town of Killarney is situated on its northern shore. On this part of the lake, although the country is diversified with gentle swells, from which delightful prospects of the water, the islands, and the surrounding scenery are obtained, yet its general character is less bold and picturesque. Immense mountains rise abruptly from the water on the southern shore, the lower districts of which are covered with luxuriant woods, while the barren summits form a striking contrast with the verdure of the lower region. From the side of one of these mountains a lofty cascade discharges a great body of water into the lake, and opposite to this cascade is the beautiful island of Innisfallen. The coast is diversified with bays and promontories, skirted and crowned with the rare *arbutus unedo*, or strawberry-tree, the holly, and other shrubs.

The middle lake is but of small extent, and possesses less variety of scenery; but its shores are in many places indented with beautiful bays, surrounded with dark groves of trees, some of which have a fine effect when seen from the water.

The upper lake is divided from the lower by the promontory of Mucross, from which the finest and most picturesque scenery is seen. This spot is remarkable for the celebrated echo called the Eagle's nest. The upper lake is about four miles long and from two to three miles broad, and is closely surrounded by mountains, from which numerous beautiful cascades precipitate their waters, while the bosom of the lake is studded with many islands, presenting great variety of rich scenery.

KESWICK, a town of Cumberland in England, is situated on the east side of the vale of Keswick, and on the banks of the lake of the same name; is a place of great resort by those who visit the lakes of Cumberland and Westmoreland; and, with a population exceeding 1600, has some manufactures of woollen, linen, and cotton.

KETTERING, a town of Northamptonshire in England, is situate on the banks of a small stream which flows into the river New, contains more than 3000 inhabitants, many of whom are occupied in the woollen manufacture.

KEW, a village of Surrey in England, chiefly remarkable for the royal palace, and still more so for the splendid gardens which were established and supported by the munificence of George III. During great part of his long reign, travelling botanists were employed in different parts of the world in collecting plants of all kinds to enrich these gardens.

KEY, in its more general acceptation, denotes something that shuts up or opens, and hence it is applied to an instrument for the opening or shutting of locks. Key, or key-stone, is the last stone of an arch or vault, which is inserted for securing the whole. Key is employed for an index or explanation of a cypher; and it denotes those parts of a musical instrument which are employed for striking the strings; and the same word is also used to denote a certain fundamental tone or note to which the whole piece is accommodated, and with which it usually begins and always ends.

KHARASM, or CHORASM, a country of Asia, having for its boundaries on the north and east Turkestan and Great Bucharia, and on the south and west Khorasan and the Caspian sea, forms a square of about 350 miles, and produces silk, cotton, and furs. The inhabitants deal in cattle and hides, which they procure from the Tartars, and export to Bucharia and Persia. Khiva is the chief town of the district, is surrounded with a mud wall and a deep ditch, and consists chiefly of low mud houses. It is 260 miles north-west from Samarcand.

KHATMANDU, or CATMANDOO, denoting the wooden metropolis, is the capital of Nepaul Proper, and the residence of the raja,—is situated on the eastern bank of a river, is composed of houses built of brick and tyle, and with wooden balconies of a singular construction. The houses are three or four stories high, but the streets are very narrow. The numerous wooden temples in the town and neighbourhood, some of which are very lofty, and are adorned with pinnacles richly gilt, form very striking objects. The population of the town is estimated at 48,000, and its distance from the Himalayah or Snowy mountains is about 40 miles.

KHOEE, a town of the province Azerbijan in Persia, is reckoned one of the finest in the kingdom, has regular streets, and is surrounded with walls. The population is estimated at 25,000, and the commercial intercourse with Turkey is said to be considerable.

KHONSAR, a town of the province of Irak in Persia, occupies a romantic spot in a narrow valley, the bottom of which, and part of the sides of the enclosing hills, are covered with houses, each of which is surrounded with a garden. The town is about six miles in length, and not more than a quarter of a mile in breadth; and the rich and luxuriant plantations, interspersed with houses, form a striking contrast with the bleak and barren mountains which rise above them. Fruits of all kinds are abundant in this sheltered spot, and the number of inhabitants in the town amounts to about 12,000.

KHORASAN, signifying the country of the sun, is an extensive province of Persia, bounded on the south and west by Cabul, Irak, Asterabad, and Dahestan, and on the north and east by the river Oxus and the country of Balkh. The northern and eastern districts are described as a flat country, intersected with sandy deserts, and some ranges of mountains of considerable elevation. The soil is generally fertile, and produces grain, rice, fruits, wine, and silk in abundance; but some of the richest districts have been laid waste, and the finest cities destroyed, by the incursions of the predatory tribes in its vicinity. Some parts of this province are in the possession of the Afghans. The principal river of the province is the Oxus, which is navigable through a great extent of its course before it joins the Caspian sea.

KIDDERMINSTER, a town of Worcestershire in England, stands on the banks of the river Stour by which it is traversed, contains two well paved streets, an elegant Gothic church, with a fine tower and windows adorned with rich tracery, and reckons more than 8000 inhabitants. Kidderminster has been long famous for its woollen and silk manufactures, in which a large proportion of the population is occupied.

KIDNAPPING is a law term, signifying the forcible abduction, or stealing away of man, woman, or child, and sending them into another country. This act was reckoned a capital offence by the Jewish law; it was also punished with death by the civil law; according to the common law of England, those guilty of this crime are punished with fine, imprisonment, and pillory; and according to a statute of William III., it is enacted, that if any captain of a merchant vessel, while he is abroad, shall force any person on shore, or wilfully leave him behind, or refuse to bring home all such men as he carried out, if they are able and desirous to return, he shall be subject to imprisonment for three months.

KIEL, a town of the duchy of Holstein, in Denmark, stands at the bottom of a bay of the same name, which forms a commodious harbour, carries on a considerable trade, which is greatly facilitated by the canal traversing the duchy, and has the advantage of a university founded about the middle of the 17th century. The population is stated at 7000.

KILDA, St. an island or groupe of islands, forming part of the Hebrides or Western Islands of Scotland, is in north latitude 57½°, and about 20 leagues west from Harris. See Hebrides.

KILDARE, signifying the Wood of Oaks, is an inland county of the province of Leinster in Ireland, is bounded on the north and east by the counties of Meath, Dublin, and Wicklow, and on the south and west by Carlow, King's county, and Queen's county, and is about 40 English miles in length from north to south, and 26 miles in breadth. The greater part of the county is a flat plain; and the celebrated Curragh includes a space of 5000 acres of fine pasture, on which immense flocks of sheep are reared. This spot is peculiarly favourable for the races, which are annually exhibited upon it.

Rivers.—The Barrow, the Liffey, and the Boyne, are the principal rivers. The Barrow forms the south-west boundary, and is partly navigable. The Liffey takes a circular course through the north-east part of the Boyne, and has its source in the bog of Allan. The Grand canal passes through the northern part of Kildare, and crosses the Liffey on an aquæduct bridge.

Population, &c.—The population of Kildare is estimated at 56,000, and the proportion of Catholics to Protestants is in the ratio of 30 to 1. The farms of this county are said to be of a larger size than in most other counties of Ireland; and the leases, which were formerly of longer duration, are now granted for 21 years and a single life. The greatest proprietor in the county is the duke of Leinster, who possesses 73,000 acres of green land, or such land as is fit for tillage and pasture.

Towns.—Naas, Athy, Kildare, and Monasteraven, are the chief towns.—*Naas* was once the residence of the kings of Leinster, is now the place at which the assizes are held, and is situated near the Grand canal on the great road between Dublin and Munster. The remains of ancient religious houses are still visible in the town, and a Danish mound or *rath* is seen at its entrance. It is 17 miles south-west from Dublin.—*Athy* is a neat little town, built on the banks of the river Barrow; and *Kildare*, occupying a pleasant spot on an eminence, is the see of a bishop, and contains many remains of religious edifices, and particularly a round tower 130 feet in height. *Monasteraven* stands on the river Barrow, and is 32 miles south-west from Dublin.—*Maynooth*, which is 10 miles north from Naas, was once a place of consequence; and a college for the education of the Roman catholic clergy has been established, and is partly supported by government.

KILKENNY, an inland county of the province of Leinster in Ireland, is bounded on the south and east by the rivers Suire and Barrow, is about 45 miles in length, and 24 miles at its greatest breadth, and includes a space equal to 511,000 English acres. A considerable extent of the county is mountainous; the prevailing rocks are limestone, micaceous and argillaceous schistus, and in some places beds of marl and limestone gravel have been found. The flag-stones which are carried to Dublin, Cork, and other parts of Ireland, are dug from quarries in this county, and the extensive collieries at Castlecoomer have been wrought for nearly 100 years. The Kilkenny coal contains a large proportion of carbonaceous matter, with very little bitumen, so that it burns without smoke or flame, and answers the purpose of drying malt. Some indications of lead, copper, and manganese ores have been observed, and forges were at one time established for the manufacture of iron ore. The beautiful black marble known by the name of Kilkenny marble, belongs to the secondary class of limestone, as it contains organic remains.

Rivers.—The Suire, the Barrow, and the Nore, are the principal rivers. The Suire forms the boundary between Kilkenny and Waterford, exhibits on its banks some picturesque scenery, and is navigable from Waterford to Clonmel, a distance of 25 miles. The Barrow forms the limit on the eastern part of the county, and is navigable in part of its course; and the Nore or Neure traverses the county for 36 miles, and admits small vessels in part of its course. All these rivers abound with salmon.

Population.—Kilkenny is divided into 127 parishes, and the population is estimated at 108,000, of which 95,000 are Roman catholics. The manufactures of this county are all of a domestic kind. The extent of bog or marsh land is not great, and

In the southern parts of the county the soil is fertile and productive. Improvements in agriculture have been introduced as well as in the breed of cattle and sheep, and in the more elevated tracts the dairy husbandry is the principal object of attention.

The remains of numerous castles are still seen in the county of Kilkenny, in consequence, it is said, of being the first part of Ireland in which the English established themselves; and of those singular structures called round towers, five are still seen in the county.

Towns.—The principal towns are, Kilkenny the capital, Callan, Thomastown, Gowran, Knocktopper, Castlecoomer, and Freshford.

Kilkenny is finely situated on the river Nore, and by means of two bridges forms a communication with the suburb or Irishtown as it is called, and is adorned with several considerable edifices, among which are the bishop's palace, the cathedral, Ormond castle, the magnificent residence of the earl of Ormond, and the college or free-school, at which about 70 students usually attend. The population of Kilkenny is about 15,000; and manufactures of coarse woollens, fine blankets, and starch, have been established.

KILLARNEY, a town of the county of Kerry in Ireland, stands on the banks of the beautiful lake of the same name. See Kerry.

KILMARNOCK, a town of Ayrshire in Scotland, stands on the banks of a small river, which traverses a fertile tract of country, and has been long famous for the activity and industry of the inhabitants in manufactures, which are greatly promoted by the abundance of coal in the immediate vicinity. Till of late years, the most of the houses consisted of a single story, and were thatched with straw, and the streets were extremely narrow and irregular;—but many improvements have been introduced not only in elegant and commodious private houses, but in the public edifices, as the town-hall, an academy in which classical and mercantile education is conducted, a reading-room, and a convenient butcher-market.

The population, in 1821, exceeded 11,000; many of the inhabitants are employed in the weaving of cotton; calico printing is carried on; but the chief manufactures which have been long established are leather and wool. Shoes to a great extent were formerly exported to America, and the Scotch bonnet was formerly one of the staple branches, and it is said this manufacture has been lately revived on an extensive scale. The carpets manufactured in Kilmarnock are said now to be unequalled by any in the kingdom, with regard to the quality of the cloth and the beauty of the pattern. The improvement in the pattern is attributed to the ingenious machinery which was invented by Mr Thomas Morton a few years ago, and which he has brought to such perfection as to enable the manufacturer to execute patterns which could not be effected on the former plan. With a view to the benefit of his native country, Mr Morton, who fits up his own machinery, has hitherto refused all orders except from Scotch manufacturers. Among other improvements in the manufactures of Kilmarnock is a new branch lately introduced, and which affords employment to many persons both men and women. The manufacture alluded to is that of shawls and plaids, richly ornamented in the loom. This manufacture has been brought to such perfection as to give the fabric, when seen at a little distance, all the appearance of silk stuff.

From this place the noble family of Boyd derived the title of earls of Kilmarnock, which was forfeited in 1745. The superiority of the town, and a large proportion of the property, are now held by the duke of Portland, who has not been slow in promoting many of the improvements of the place, among which may be mentioned a railway ten miles in length, which extends from Kilmarnock to the harbour of Troon, and by which not only coals, farm-produce, and different kinds of goods are carried, but passengers have an easy and expeditious conveyance.

KILSYTH, a town of Stirlingshire in Scotland, is about half-way between Glasgow and Stirling, has risen to considerable importance of late years by the introduction of the cotton manufacture from Glasgow, and, including the parish, contains more than 2000 inhabitants.

KILWINNING, a town of Ayrshire, about three miles north from Irvine, stands on an elevated plain, which rises from the banks of the river Garnock, and is famous for its ancient monastery, the ruins of which still remain, and as being the seat of the first mason-lodge in Scotland, which, it is said, was established about the middle of the 12th century, by the architect and masons who came from the continent to assist in the building of the monastery. From this lodge all other lodges of free-masons in Scotland derive their origin. Kilwinning has been also long famous for the practice of archery; and a prize is still annually shot for by the members of the society, which is composed of most of the gentlemen in that part of the country. The population, including the parish, is about 3000.

KINCARDINE, a town of Perthshire in Scotland, stands on the north bank of the Forth, has a commodious harbour, and enjoys some trade with the Baltic, as well as with different places on the coast. Wood, iron, and hemp are imported; and coals, grain, and spirits, the latter the produce of extensive distilleries in the neighbourhood, are exported to a considerable amount.

KINCARDINESHIRE, or Mearnshire, a county of Scotland, which is bounded on the north by the river Dee and part of Aberdeenshire, on the east by the German ocean, and on the south and west by the river North Esk, which forms the limit with Forfarshire. The greatest length of the county is about 32 miles, and the greatest breadth from north to south about 24 miles. From its diversified surface, great diversity of climate prevails in the different districts.

Aspect.—A considerable extent of the surface of this county is occupied by mountainous ridges or with barren heaths, which are scarcely susceptible of improvement by culture. A ridge of the Grampians which traverse Scotland from Dumbartonshire to the Moray frith runs along the north-west division of the county, and terminates near the sea at

Stonehaven. Great part of the surface near the sea-shore is a barren tract, covered with sand-hills, or terminating in precipitous rocks on the shore. The How or Hollow of the Mearns, as it is called, forms the centre of the county, and, being well sheltered from the north and east winds, enjoys a temperate climate. Some of the mountains have an elevation of 3500 feet above the level of the sea. The rocks of the Grampians belong to the primitive class, and are chiefly composed of granite, micaceous and argillaceous schistus. Red sandstone is met with in the lower districts; and the precipitous rocks along the coast consist chiefly of breccia or plumpudding-stone. Some of these rocks are not less than 200 feet in perpendicular height; and, as they afford shelter for various species of sea-fowl, they are the scenes of great enterprise and hazard during the season of bird-catching.

Rivers.—The Dee and the North Esk are the principal rivers of the county, although the latter is to be considered only as the boundary line with Forfarshire; but the Dee rolls its limpid stream for several miles through Mearnshire, and, with its banks richly clothed with wood, presents some of the most picturesque scenery. The county is watered by several smaller streams, as the Bervie, which joins the sea at the town of the same name, and the Cowie, which falls into the German ocean at Stonehaven. Two small lakes, in the northern part of the county, give some variety to its surface.

Population, &c.—The population of Kincardineshire in 1811 was estimated at 27,581, of whom one-half is said to be occupied in agriculture, and the other half in manufactures, trade, and fisheries. Many of the modern improvements in agriculture have been introduced, and the principal crops are oats, beer, turnips, wheat, and potatoes. The principal manufactures are osnaburgs, sacking, canvas, and coarse linens, and a few spinning-mills have been erected. About a thousand of the inhabitants are employed in the white fishery, and in the valuable salmon fishery on the North Esk, or are supported by the produce. The salmon is sent to London, and dried fish to Leith; the other exports are chiefly grain; and coals, lime, timber, and flax are imported.

Antiquities.—The remains of numerous castles or strongholds are still visible on insulated rocks on the sea-shore; among which, Dunnottar castle, the ancient seat of the Earls Marischal, in the vicinity of Stonehaven, is worthy of notice, as being a place of great importance in the early history of the kingdom. Vestiges of Roman camps still appear near Ury and Stonehaven; and one of the same description, near the mansion-house of Fordoun, is yet very entire.

Towns.—Stonehaven, Bervie, and Laurencekirk are the principal towns, beside which several thriving villages have arisen in different parts of the county.

Stonehaven, or *Stonehive*, is the capital of the county, and is situated in the parish of Dunnottar, about 15 miles south from Aberdeen. It has been greatly extended and improved of late years, has a small harbour which is a natural basin and well sheltered, and some of the inhabitants are employed in the manufacture of coarse linen. The population exceeds 1200.

Bervie, or *Inverbervie*, is the only royal borough in the county, is said to have received its charter from King David in 1342, as an acknowledgment of the hospitality which he experienced when he was compelled to take shelter from a storm. Bervie was formerly a considerable fishing station; but the inconvenience of the harbour has led the fishermen to remove to a more eligible situation two miles to the southward, and this place is now to be considered as the seaport of Bervie. The number of inhabitants, including the parish, which is of small extent, exceeds 1000.

Laurencekirk owes its existence to the public spirit of Lord Gardenstone, into whose possession the property fell in 1762. Three years afterwards, he laid down a plan for a new village, feued lots of land for houses and gardens, and granted leases of small farms for 100 years at a low rent. These advantages rapidly attracted settlers to the village. In 1779 it was erected into a borough of barony, with power to elect magistrates, and to hold weekly markets and an annual fair; a commodious inn was erected, and a library formed for the amusement of travellers. Various manufactures were introduced, and particularly that of the beautiful snuff boxes, which, on account of the ingenuity and delicacy of the workmanship, are still in great request. Laurencekirk is seven miles west from Bervie, and the population exceeds 600.

KING, WILLIAM, a learned Irish prelate, was descended from a Scotch family, and was born at Antrim in 1650; and having finished the early part of his education, he was removed in 1667 to Trinity college, Dublin, to pursue his academical studies. Having received priest's orders, in 1674, from the archbishop of Tuam, he was collated by his patron to a prebend in his own church; and when the archbishop was advanced to the see of Dublin, Mr King was preferred to the chancellorship of St. Patrick, and to other valuable benefices. His learning and abilities qualified him to become a powerful champion in defence of the Protestant religion, by the publication of three tracts. While he was engaged in this controversy, he was elected dean of St. Patrick; and when the revolution was effected in England in 1688, the dean became a strenuous agent in promoting it in Ireland. When the authority of King William was fully established, the zeal and activity of Dr King in favour of the revolution were rewarded with the Episcopal dignity, when he was consecrated to the see of Derry. For some years the learned bishop was actively employed in political writings; and in an attempt to convert the Presbyterians of his diocese to the Episcopal discipline, he was involved in a keen controversy with the dissenters.

In the year 1702, Dr King was advanced to the archbishopric of Dublin; and about the same time he presented to the world his treatise On the Origin of Evil, the most elaborate of his works, by which his name has been transmitted to posterity. The object of this work is to shew how all the several kinds of evil which exist in the world are consistent with the goodness of God, and may be accounted for without the supposition of an evil principle. Some of the doctrines of this treatise were warmly controverted by different continental writers, and particularly by Bayle and Leibnitz. This treatise was translated from the Latin into English by Dr Law, afterwards bishop of Carlisle; and to the same author were communicated the archbishop's manuscripts after his death, from which the additions and improvements, with answers to objections, were extracted and published in a second edition. Dr King was also the author of single sermons, preached on public occasions. He died in 1729.

KING'S BENCH is the supreme court of common law in England, and is so called because, in former times, the king himself used to sit in person, and is still supposed to preside in it. This court consists of a chief justice and three other judges, who are officially the sovereign conservators of the peace and supreme coroners of the land. Although the court of King's Bench has been held at Westminster for several centuries, yet it is not fixed to any certain place, but may follow the king's court wherever it happens to be. The jurisdiction of this court is very high; it keeps all inferior jurisdictions within the proper limits of their authority; superintends all civil corporations; commands magistrates and others to discharge their duties in all cases where the law has made no special provision; protects the liberty of the subject; takes cognisance both of criminal and civil causes; and has an original jurisdiction and cognisance of all trespasses and other injuries. This court is also a court of appeal, into which may be removed, by writ of error, all decisions of inferior courts of record, and an appeal lies from this court to the House of Lords, or the court of Exchequer chamber, according to the nature of the case. Blackstone's *Commentaries*.

KING'S COUNTY, an inland county of the province of Leinster in Ireland, is bounded on the north and east by West Meath, Kildare, and Queen's county, and on the south and west by Tipperary, Galway, and Roscommon; is more than 40 miles in length, and, in some places, between 30 and 40 miles in breadth.

With the exception of a range of mountains which forms the boundary with Queen's county, the surface is generally flat. Freestone, rocks of an argillaceous nature, and limestone, are the prevailing strata, and a clay soil is very common in the northern part of the country, while it is of a light sandy loam in the central districts.

Rivers.—The Shannon, which forms the line of separation, and the great and little Brosna, two of its tributary streams, are the principal rivers. The Grand canal traverses the northern part of the county, and the largest proportion of the bog of Allan covers its surface. Not less, indeed, than one-third of the county is supposed to consist of bog land.

Population, &c.—The population is stated at 75,000, and is supposed to be on the increase. The proprietors and farmers have adopted the modern improvements in agriculture, and some of the farms are in an excellent state of cultivation. Oats and barley are the principal crops, but green crops and artificial grasses are not neglected, and the drilling of potatoes is practised. The grazing farms are of great extent, and afford excellent pasture to numerous flocks of sheep, whose fleeces furnish wool of a good quality.

Towns.—The chief towns are *Philipstown*, at which the assizes are held, and which is 38 miles west from Dublin; *Parsonstown*, or *Birr*, which is not far from the borders of Tipperary, and is 34 miles north-east from Limerick; and *Tullamore*, which is situated near the Grand canal, is 44 miles from Dublin, and contains about 4000 inhabitants, of whom the Catholics form the largest proportion.

KINGHORN, a royal borough of Fifeshire in Scotland, stands on a declivity on the coast of the Firth of Forth, nearly opposite to Leith, is a place of considerable antiquity, and is said, indeed, to have been, at one time, the seat of royalty. The spinning of cotton and flax, which has been lately introduced, and thread stockings, are the only manufactures; and the population of the town and parish exceeds 2000.

KINGSTON, the principal sea-port town of Jamaica, stands on a declivity on the north side of a bay, and on the south side of the island. See JAMAICA.

KINGSTON-UPON-THAMES, a town of Surrey in England, is supposed to derive its name from having been the residence of many of the Saxon kings. The distance from London is eleven miles; and the population, including the parish, exceeds 4000. See SURREY.

KINGSTON-UPON-HULL, a town of the East Riding of Yorkshire in England, is situated near the confluence of the rivers Hull and Humber, and not only carries on a commercial intercourse by means of inland navigation with most parts of England, but enjoys a very extensive foreign trade. See YORKSHIRE.

KINROSS-SHIRE, an inland county, and one of the smallest in Scotland, is surrounded by the counties of Fife and Perth, and is about 13 miles long and 11 miles broad. The Ochil hills, which form its northern boundary, and the Lomonds on the limits of Fifeshire on the east, scarcely rise to a mountainous elevation within the county; and although, in other parts, the surface presents much inequality, yet it is scarcely to be considered as hilly.

Lochleven forms one of the most striking features of Kinross-shire. This fine expanse of fresh water covers a space of more than 300 Scottish acres; is, in some places, more than 80 feet in depth, contains several islands, and abounds with different kinds of fish, and, particularly, different species of trout, as the salmon trout, the river trout, and the char, known in the Edinburgh market, where they are often met with, under the general appellation of Lochleven trout. Eels, pike, and perch are also natives of this lake, and the latter are sometimes so abundant as to be conveyed to Edinburgh in cart loads, and carried through the streets for sale at a very moderate price. Lochleven is supplied by numerous small streams which flow from the surrounding elevated tract of country, and its principal outlet is in the south-east quarter, where it gives rise to the Leven, which traverses Fife and falls into the firth of Forth.

Population, &c.—The population of this county, in 1811, exceeded 7000. The inhabitants are chiefly occupied with agriculture; and the manufacture of coarse linens and of muslin has been introduced on a limited scale.

Antiquities.—Among the antiquities of Kinross-shire are enumerated the monastery of Portmoak, and the castle on one of the islands of Lochleven, which is said to have been a royal residence of the Picts; but it is more memorable, at a later period of Scottish history, as the prison of Queen Mary, when she resigned the crown in favour of her son James VI. in July 1567. With the assistance of George Douglas, the younger brother of Douglas of Lochleven, she made her escape in the month of May of the succeeding year, and not long after, seeing the desperate state of her affairs, retired to England.

Kinross, the capital, and only town of the county, stands at the west end of Lochleven, and consists chiefly of one street, with many excellent houses. The manufacture of some kinds of hard-ware, for which Kinross was formerly celebrated, has declined, and coarse linen and cotton goods are the chief manufactures. The population, including the parish, in 1811, was estimated at 2200.

KINSALE, a sea-port town of the county of Cork in Ireland, stands at the mouth of the river Bandon, and contains 10,000 inhabitants. See CORK.

KIOF, or KIEF, is the capital of a government of the same name in the Russian empire, is situated on the Dnieper, and consists of three small towns,—namely, the fortress of Pethersky, including the barracks, several churches, an elegant convent, and very extensive suburbs; the old city of Kiof, which is situated on an eminence, and is defended by fortifications, and includes the cathedral, which is the seat of the archbishop and metropolitan of all Russia; and the New Town, on a plain near the banks of the river, which contains several churches and convents, and the college or academy.

KIPPIS, ANDREW, a learned divine among the English dissenters, was a native of Nottingham, and was born in 1725. On the occasion of his father's death, when the son was only in his fifth year, he was removed to Sleaford in Lincolnshire, where he received the early part of his education, and by his talents and proficiency attracted the notice of the pastor of a congregation of dissenters at that place, a gentleman of extensive learning and fine taste, to whose patronage and friendly advice he always expressed the highest obligation, and by which, it is understood, he was led to direct his views to the clerical profession. Placed in 1741 in the academy of Northampton, then under the superintendance of the celebrated Dr Doddridge, and in high reputation, Mr Kippis made great proficiency in all the prescribed studies; and having completed his academical course of five years, he was invited to become the pastor of a dissenting congregation at Dorchester; but having received at the same time an invitation to a similar situation at Boston in Lincolnshire, he preferred the latter, and was settled in 1746; continued in that place till 1750; was afterwards removed to Dorking in Surrey; and in 1753 was appointed to the presbyterian congregation in Long-ditch, or Princes street, Westminster.

The situation which Mr Kippis now held, enabled him to turn his literary talents not only to his own advantage, but also to that of the public. In his capacity of pastor of the congregation over which he presided, he became a manager of the fund instituted for the assistance of the poorer congregations of dissenters, and the support of their clergy, as well as for enabling students to qualify themselves for the pastoral office. Among other plans which he had projected for his future life, he had announced his intention of superintending a limited number of pupils in his own house; and was on the point of executing this scheme, when he was induced to accept of the place of classical and philological tutor in Coward's academy,—a situation which he held with great credit to himself, and with much benefit to the young men under his care, for more than 25 years. In 1767, he received the degree of doctor of divinity from the university of Edinburgh; and by being admitted a fellow of the Royal society, and a member of other learned associations, he was honoured with other literary distinctions.

Beside his professional duties, the literary avocations of Dr Kippis required so large a share of his time and attention, that he found it necessary, in 1784, to resign his appointment in that academy; and as the academy itself was discontinued in the succeeding year, a new institution at Hackney, in the vicinity of London, was formed in 1786, in which Dr Kippis, with some reluctance, accepted the office of one of the tutors; and having held the situation for several years, he at last withdrew from it on account of its inconvenient distance. His labours were more confined to his clerical functions and private studies till the time of his death in 1795, when he had reached the 71st year of his age.

With a mild and gentle temper, an easy address, and polished manners, Dr Kippis possessed a comprehensive understanding, a retentive memory, a sound judgment, and a refined taste, and a great quickness and facility in exerting his faculties on any subject that occupied his attention. The regular distribution of his time, and the judicious arrangement of his studies, enabled him successfully to cultivate those powers, and to attain high acquirements in the various branches of science and literature. In his lectures and private conversations he possessed a happy method of conveying instruction; and by his friendly conduct and courteous demeanour to his pupils, not only secured their attention, but excited their regard and warm affection. His habit of early rising, as it not only contributed to his health, but afforded him a large portion of time for improvement, and made him less liable to be interrupted by foreign avocations, merits the imitation of every studious young man.

Exclusive of the studies more immediately connected with the clerical profession, Dr Kippis excelled in his knowledge of classical literature, belles lettres, history, and geography. He commenced his career as an author in the Gentleman's Magazine; he contributed several valuable papers to the periodical publication called the Library; and in the theological, historical, and philological departments of the Monthly Review he was a frequent writer. He projected the improved plan and laid the foundation of the New Annual Register, of which he selected the miscellaneous parts, and wrote the accounts of Domestic and Foreign Literature from the commencement of the work to the year 1784; and he was the author of the Review of the Transactions of the Reign of George III. prefixed to the Register for 1780, and of the History of Knowledge and Taste in Great Britain, prefixed to the preceding volumes, to the year 1794. Beside various fugitive pieces, Dr Kippis was the author of the Life of Sir John Pringle, prefixed to his six discourses delivered at the Royal Society, of the Life of Captain Cook, and of the Lives of Dr Lardner and Dr Doddridge. But the improved edition of the Biographia Britannica occupied the greatest share of the attention of Dr Kippis during the last years of his life, and for the execution of this work he was peculiarly qualified, by his extensive knowledge of men and books, his indefatigable assiduity in collecting materials, and his sound judgment, impartiality, and candour. Dr Kippis lived only to complete about a third part of the sixth volume; but the excellent qualities which he possessed for the undertaking, and the perspicuity, elegance, and purity of the style in which that part which belongs to him is executed, have given his name a conspicuous place in the literature of the country.

KIRCHER, Athanasius, a learned German mathematician, philosopher, and antiquary, was born at Fulda in the year 1601, was educated in the society of the Jesuits, and having commenced his noviciate in 1618, he was soon distinguished by his rapid proficiency in literature and science. Having taken the habit, and completed his regular course of studies, he was appointed to fill the chair of professor in the university of Wurtzburg in Franconia, and taught philosophy, mathematics, the Hebrew and Syriac languages, with great success, till the year 1631, when the country was disturbed and harrassed by the war between the Emperor Ferdinand II. and Gustavus Adolphus of Sweden. He was compelled for safety to retire to France; and having spent some time in the college of Jesuits at Avignon, he was invited to Rome to fill the chair of mathematics in the Roman college. He afterwards undertook the professorship of Hebrew; and he died in that city in 1680, when he had reached the 80th year of his age. When it is stated that the works of father Kircher amount to twenty-two volumes in folio, eleven in 4to, and three in 8vo, it cannot be denied that he possessed indefatigable industry; but he possessed also extensive erudition, although it must be admitted that the subjects of his studious labours were more frequently of a curious than useful nature; and it is easy to perceive, that a visionary fancy, rather than a sound judgment, pervaded his investigations. Whatever bore the mark of antiquity seized his attention, and his passion for deciphering hieroglyphical characters was unbounded. He wrote on the subject of the magnet, and on optics, and in his treatise entitled *Ars Magna Lucis et Umbræ*, he gives an account of an attempt to imitate the burning mirrors of Archimedes, and a description of the magic lanthern, of which he is supposed to have been the inventor. To ascertain the possibility of Archimedes having set fire to the Roman fleet by means of mirrors, he made a voyage to Sicily for the purpose of examining the harbour of Syracuse. *Musurgia Universalis* is a treatise on the theory and practice of music. He wrote also on the Theories of the Heavens and the Earth, Antiquities of Egypt, and the History of China; and he founded a museum at the Roman college, consisting of medals, mathematical instruments, rare animals, and minerals. This museum was completed by Philip Bonanni, by whom a description was drawn up and published at Rome in 1709, in a large folio volume, with the title of *Musæum Kircherianum, &c.* illustrated with numerous engravings. But, for the particular titles of his works, see Aikin's *General Biography*.

KIRKALDY, a borough town of Fifeshire in Scotland, contains about 4000 inhabitants, many of whom are actively engaged in manufactures and trade. See Fifeshire.

KIRKBY is the name of several towns in different parts of England, which are distinguished from each other by some specific appellation, as Kirkby-Lonsdale in Westmoreland, which is 12 miles south-east from Kendal, and contains more than 1200 inhabitants, some of whom are employed in the woollen manufacture;—Kirkby-Steven, another town of Westmoreland, the population of which is nearly the same, and some of the inhabitants are occupied in the manufacture of stockings;—and Kirkby-Thore, also a town of Westmoreland, which, from the coins, urns, and other remains, appears to have been a Roman station, and through it passed the ancient military road called the Maiden-way, because it commenced at Maiden castle in Stanmore in Yorkshire.—Kirkby-Ireleth is a town of Lancashire, with more than 1000 inhabitants; and Kirkby-Moorside is a town of Yorkshire, with 1500 inhabitants.

KIRKCUDBRIGHT, a county of Scotland, or, as it is usually called, *stewartry*, because the earls of Nithsdale were hereditary stewards, forms part of the ancient province of Galloway, and is bounded on the south by the Solway firth, on the east by Dumfriesshire, and on the north and west by the counties of Ayr and Wigton, and covers a space of more than 449,000 Scotch acres.

Aspect.—In its general aspect, this district presents a very unequal surface. Along the shores of the Solway firth, the extent of alluvial land is considerable; in the interior the country is hilly; and towards the borders of Ayrshire it rises nearly to a mountainous elevation, and is covered with heath and moss. The prevailing rocks belong to the primitive class; a beautiful grey granite is abundant, and is employed for the purposes of building; some of the mountains are composed of syenite; grey wacken is common, and porphyry and red sandstone appear in some places. Previously to the year 1790, a lead mine near the western limit of the stewarty was successfully wrought for 25 years, but the produce of ore having declined, the operations have been relinquished; and some ores of cobalt, copper, and zinc were extracted from the same veins. Quarries of roof slate are wrought in several places.

Rivers.—The rivers of this county have their origin in the elevated tract on the borders of Ayrshire. The Ken and the Deugh uniting their waters form the fine lake called Loch-Ken; the Dee mixes its waters with the same lake, and retains its name as it passes from it, and continues its course to the Solway firth. This river is partly navigable, and is famous for its salmon fishery. The Urr and the Fleet are smaller streams, but are navigable for a few miles; and the Nith on the east, and the Cree on the west, form the boundaries with the adjoining counties.

Plantations, &c.—The extent of copsewood is considerable, and, when at no great distance from the sea, is of considerable value, on account of the produce of oak bark. Some of the great proprietors have of late years formed extensive plantations, which add greatly to the ornament of the country. The public roads throughout the stewartry have been laid out with great skill, and are kept in excellent repair.

Population.—The population of the stewartry of Kirkcudbright in 1801 amounted to 29,058; in 1811 it had increased to 33,734; and in 1821 it had increased still farther to 38,913.

Agriculture, &c.—All the modern improvements in agriculture have been introduced where tillage is practised, and in many places on the low grounds excellent crops of grain are obtained; but the rearing of black cattle is the principal object of attention in many parts of the district. The breed of cattle called the Galloway breed is in high repute in the English market. In the hilly districts the breed of sheep is universally of the blackfaced kind. The Galloway horses, which were at one time famous for their hardy character, are now less common, by the introduction of a mixed breed.

The spinning of cotton and wool, by means of machinery, has been attempted, but without success. The want of fuel, and the distance from the market, are regarded as the causes of this failure.

Antiquities.—Several remains of baronial residences are yet visible in the stewartry. The castle of Threave, which stands on an island formed by the river Dee, is said to occupy the site of a more ancient fortress belonging to the lords or kings of Galloway. It was annexed to the crown in 1455, and in 1502 a keeper was appointed by the king along with the office of steward of the stewartry; and some years afterwards a similar grant was made to the Lord Maxwell, whose descendants, the earls of Nithsdale, held the heritable office of stewards till the year 1747, when all heritable jurisdictions in Scotland were abolished. Kenmore Castle stands on an eminence at the head of Loch-Ken, and is said to have been one of the seats of the ancient lords of Galloway, and a favourite residence of John Baliol. The castle of Kirkcudbright was built by the ancestor of Lord Kirkcudbright about the year 1570, on the site of the collegiate church, which was demolished by the reformers. On one part of the building appears the date 1582, supposed to be the time when it was completed. New Abbey, which, in its mouldering remains, sufficiently attests its former magnificence, was founded in the beginning of the 13th century, by Devorgilla, daughter of the lord of Galloway, and wife of John Baliol, lord of Castle-Bernard. Baliol was buried within the walls of the new foundation, and, according to tradition, his lady caused his heart to be taken out and embalmed, put into an ivory box, which was bound with silver, and the whole shut up with great solemnity in the walls of the church, near the high altar, from whence the edifice is still known by the name of *Sweetheart Abbey*. New Abbey stands on the banks of the Nith, a few miles below Dumfries. Dundrennan abbey, near the Solway firth, was also a magnificent structure, and was founded by a lord of Galloway in 1142. It is memorable in Scottish history, as the last residence of the unfortunate Mary in her native dominions, before she took the fatal step of crossing the Solway firth, and committing her life and fortunes to her rival Elizabeth. The moat of Urr is a remarkable artificial mount, intended for a public assembly, and either as a place of judicature or a national council. It is supposed to be of Saxon origin.

Towns.—The towns of the stewartry are Kirkcudbright and New Galloway, which are royal boroughs, Gatehouse, Creetown, Castle-Douglas, Maxwelltown, and the villages of Kelton and Dalbeaty.

Kirkcudbright is the capital of the stewartry, stands on the banks of the river Dee, about six miles from its junction with the Solway firth, is a place of considerable antiquity, and is surrounded with varied and picturesque scenery. In the immediate vicinity of the town is the fine residence of the earl of Selkirk, on St Mary's isle, a peninsular spot, adorned with luxuriant plantations. At this place the celebrated Paul Jones landed in the time of the American war, and carried off the silver plate belonging to the family, but it was afterwards restored.

Many improvements have been introduced into the town of late years; the streets are well paved, and the houses well built. A new jail, in the Gothic style, has been lately erected, as well as a spacious and elegant academy as a seminary of learning. The remains of the old castle in the town, which are pretty entire, gives it an imposing air of antiquity. The river Dee is of sufficient depth to admit vessels of considerable burthen, and it is navigable two miles above the town for ships of 200 tons. The population may be estimated at 3000, but no manufactures of any importance have been introduced.

New Galloway is also a royal borough, and occupies a pleasant spot at the head of Loch-Ken. The number of inhabitants is about 700. *Creetown* is a beautiful village on the east side of Wigton-bay, and contains about 1000 inhabitants, chiefly employed in agriculture. *Gatehouse* is also a fine village, and contains about 1000 inhabitants, stands on the Fleet, about four miles from its junction with Wigton bay, and owed its rise chiefly to the mills erected in 1788 for the spinning of cotton. *Dalbeaty*, on the river Urr, has about 800 inhabitants, and is an improving village. *Keltonhill* is celebrated for its markets and fairs, at which great numbers of cattle and horses are sold; *Castle-Douglas* is a neat and well built village; and *Maxwelltown*, although in the stewartry of Kirkcudbright, is to be regarded as a suburb of the town of Dumfries.

KIRKWALL, the capital of the Orkney islands, is situated in the island of Pomona, or, as it is sometimes called, the Main Land, consists chiefly of one narrow street, which runs parallel with the shore. The cathedral church, a venerable Gothic structure, is still employed as a place of worship, and in its immediate vicinity are the ruins of the residence of the earls of Orkney and of the bishop's palace. The cathedral of St Magnus, which is so named from Magnus king of Norway, the supposed founder of the town, is said to have been begun by a count of Orkney before the middle of the 12th century. The population of the town and parish is calculated at about 3000. The inhabitants are chiefly employed in agriculture and fishing, and some manufactures of linen and cotton have been introduced.

KIRRIEMUIR, a town of Forfarshire in Scotland, stands on a declivity, and contains about 2000 inhabitants, who are chiefly occupied in the manufacture of Osnaburgs and coarse linens.

KIRWAN, WALTER BLAKE, an Irish clergyman and celebrated preacher, was a native of Galway, and was born in 1754. His parents were of the Roman catholic religion, and he was sent, at an early age, to the college of English Jesuits at St Omers, where, during a residence of seven years, he made great proficiency in classical literature; and he has been often heard to declare, that in the shades of this seminary he was first inspired with the noble ambition of becoming useful to mankind.

In his 17th year young Kirwan embarked for the Danish island of Santa Cruz, under the protection of his father's relative, who had large possessions in that settlement. During a residence of five years, he had a continual struggle with ill health, in a region the influence of which was not less injurious to the constitution than the scenes he was compelled to witness were hurtful to the better feelings of the heart. He returned to Europe at the age of 23, and the inclination which he shewed to devote himself to a life of study was encouraged by his maternal uncle, who then held the titular dignity of Roman catholic primate of Ireland. By his advice he was destined for the church; and, to qualify himself for the clerical office, he repaired to the university of Louvain in the Austrian Netherlands, and, after the proper course of instruction, was admitted to priests orders. Mr Kirwan still persevered in his studies, and, from his talents and acquirements, was appointed to the chair of natural and moral philosophy in the university. For three years he discharged the duties of his office with much credit to himself, and highly to the satisfaction of his pupils, till he was invited, in the year 1778, to officiate as chaplain to the Neapolitan ambassador at the British court. For seven years he performed the duty of pastor to this small congregation, composed chiefly of English catholics, who attended the ambassador's chapel. This period of his life he regarded as peculiarly interesting, not only as he found among his own flock persons of the most unaffected piety and of the most liberal sentiments, but also as it afforded him an opportunity of listening to men of great powers of oratory, both at the bar and in parliament, and of hearing the best preachers of every sect and denomination of Christians, which latter circumstance, it is supposed, may have contributed not a little to the change that was soon to take place in his opinions. He was an enthusiastic admirer of his countryman Mr Burke, and, it is said, was so struck with his eloquence, that the orator being in the middle of a speech when Mr Kirwan entered the House of Commons, and heard him for the first time, the harangue was continued for several hours without his curiosity being excited to learn the name of the speaker.

An eventful period of Mr Kirwan's life now approaches. After spending two years in retirement and in the bosom of his family, he came to the resolution of renouncing the church of Rome, and of conforming to the religion of the established church. This solemn act took place in the parish church of St Peter's in Dublin, under the auspices of the archdeacon of the diocese. Of the motives which led to this change, various opinions, no doubt, have been entertained; but considering the high respectability of his character, and the warmth and zeal with which he devoted his services to the cause of religion and humanity, the most prejudiced can scarcely refuse to admit that they were pure and conscientious.

Much interest and curiosity were excited to hear the first sermon of the new convert. Some expected that he would indulge in invective at the errors of the church which he had left, and others thought that he would employ his eloquence in praise of the principles and practice of that of which he was admitted a member; but all were disappointed. On the day of his conforming to the Protestant religion, he preached to a crowded audience in St Peter's church, and without the slightest allusion to the motives which led to his appearance in that place, and without any invidious comparison, he confined his sermon to the great outlines of Christianity.

Mr Kirwan's first appearance as a Protestant preacher was a new era in sacred eloquence, and his exertions in pleading the cause of charity were successful beyond any thing formerly known. The asylum for destitute female orphans in Dublin was one of the first charitable institutions that called for his exertions; with talents the display of which at once gratified the imagination, convinced the judgment, and melted the heart, he took up their cause; and such was the magical effect of his extraordinary powers, that congregations, nearly amounting to suffocation, flocked to listen and to contribute. Females of the highest rank and most splendid fortunes, not content with their own large contributions, were seen exerting every fascination and charm of intreaty to induce the co-operation of all ranks; and it will appear incredible to state, that at one sermon for this institution the sum of L.1500 was received. But his exertions were not confined to this institution alone; other charitable institutions of the city of Dublin, have gratefully acknowledged the success of his appeals to the public in their favour, and in particular the school of his own parish has risen, from being a neglected receptacle for a few poor children, to the rank of a respectable and valuable seminary for a populous district.

The talents of Mr Kirwan were not overlooked by those who have the power of church preferment. He was presented to a valuable living in the city of Dublin by the archbishop, and at the recommendation of Marquis Cornwallis, then lord-lieutenant, he was appointed to the deanery of Killala, and if his life had been spared higher honours and preferments would have awaited him. During the period of 17 years, he was destined to address audiences literally overflowing in number and mercy; and as the glorious fruit of his extraordinary appeals to the head and the heart, a sum exceeding L.50,000 has been collected and devoted to the protection and education of friendless children. "But in feeding the lamp of charity he almost exhausted the lamp of life," was the expression applied to him by Mr Grattan, another distinguished orator of the same country. His health, during the greater part of his life, had been always delicate; and in the end of the year 1805 he was seized with a fever, which in a few days brought him to the grave. His funeral was attended by an immense concourse of the most respectable citizens, including almost every friend to humanity and genius in Dublin, and the children of the several charity schools joined in the procession. The following character has been drawn of this eminent preacher.

"Endowed with talents beyond the common lot of mankind, gifted with powers of eloquence which formed as it were an era in the annals of pulpit oratory, he devoted those talents and that eloquence to the service of his God and of the poor. In the cause of religion, impressive, commanding, overwhelming, vice shrunk appalled from the resistless torrent of his eloquence, and trembled at its own deformity. In the cause of charity, energetic, persuasive, irresistible, he turned the master passions at his will, now roused with dread, now melted with compassion, while every bosom glowed with re-animated feeling, the sweet influence of benevolence throbbed in every pulse, and poured from every eye."

KISHMA, one of the largest islands in the Persian gulf, extends parallel to the coast about 60 miles, but is not more than 12 miles in breadth; and is separated from the continent by a channel which is from four to eight miles broad, and is navigable for the largest vessels. The harbour on the south coast, formed by the island of Angar, is safe and commodious; the soil of the island answers for raising grain; and wheat and barley are produced in sufficient abundance for the wants of the inhabitants, who are much occupied in fishing, and in the rearing of sheep and cattle. This island is in possession of an independant Arab Sheik, who pays homage to the governor of Muscat; but his authority it would appear is not very efficient, as his territory is subject to the incursions of the tribes on the Arabian coast, and as late as the year 1809 the English found it necessary to interfere and destroy a horde of pirates who had a settlement on the west side of the island.

KLAPROTH, Martin Henry, an eminent German chemist, was born in 1743 at Wernigerode in the Hartz. The scanty circumstances in which his parents were placed, rendered his early education very defective; but, by his indefatigable industry, he improved it greatly at a later period of life. It would appear that he applied to the study of pharmacy, and by the efforts of his own native genius, and the instructions of the celebrated Margroaf of Berlin, in whose laboratory he was engaged, he became one of the first practical chemists of his time. His powers as a chemist consisted partly in a happy talent of combination, in which he was aided by his thorough knowledge of all the auxiliary sciences, partly in a quick and judicious view and discrimination of bodies, and in a very great degree in the wonderful facility, precision, and neatness with which he conducted his experiments. If a new substance was presented to him, he rested neither day nor night till he had fully examined it, and decomposed it into the simplest elements. Among the chemical discoveries of Klaproth, are enumerated the new earth of zirconia, and the new metals tellurium, titanium, and uranium.

The writings of this distinguished chemist are very numerous; beside his contributions to periodical journals, he assisted in revising several useful scientific dictionaries, and, in conjunction with Wolf, was the author of an excellent chemical dictionary. Three volumes of his Analytical Essays were published, and have been translated into French, Italian, and English.

The distinguished merits of this eminent man secured for him the highest honours; he was raised to the rank of Counsellor of the Medical Department in Prussia, elevated to the order of knighthood, and admitted a member of the academy of Berlin, as well as of almost all the learned societies in Europe. One of the few places which the French Institute reserves to foreigners was conferred on Klaproth. But his high merits as a man of science were not surpassed by the uprightness and unaffected simplicity of his character.

With the approaches of old age, although his health declined, his faculties and activity remained unimpaired and undiminished. He died in the begining of 1817, when he had reached the 74th year of his age. The esteem which he enjoyed was strongly marked at his funeral, which was attended by the most distinguished men of letters, and the most respectable characters in Berlin. His son, Henry Julius Von Klaproth, has already acquired celebrity by his travels on Mount Caucasus, as well as by his knowledge of the Chinese language.

KLAUSTHALL, a town of the principality of Grubenhagen and the kingdom of Hanover, derives it chief importance from the mines in the Hartz mountains in the neighbourhood, and contains about 8000 inhabitants. A mint for coining money is established. The level for carrying off the water from the mines, a work of immense labour, is conducted nearly seven miles at a depth of nearly 900 feet.

KLEINHOVIA, a genus of plants belonging to the Gynandria class.

KLEIST, Christian Ewald Von, a celebrated

Klopstock.

German poet, was a native of Zœblin in Pomerania, and was born in 1715; received the early part of his education at the Jesuits college in Upper Poland, and continued his studies at the academy of Dantzic and the university of Konigsberg. While on a visit to his relations in Denmark, he was induced to enter into the Danish service, which he exchanged for that of Prussia, and was soon promoted to the rank of captain by Frederick the Great. The earliest production of his muse was addressed to a brother officer; and soon after appeared his "Hymn to the Deity;" and during his confinement, in consequence of a wound received in a duel, his popular poem, entitled "Spring," was composed, and was first published in 1749.

Anxious to distinguish himself in his military capacity, he requested and obtained leave to take an active share in the campaign of the year 1759; and being present at the battle of Kunnersdorff, which was fought with the Russians on the 12th of August, he displayed the most heroic bravery in the successive attack of four batteries, and at last fell covered with wounds. Having remained two nights on the field of battle, and stripped naked by the Cossacks, he was recognised by some Russian officers, and conveyed to Frankfort on the Oder, where he was treated with the utmost kindness and attention; but he died of his wounds in the course of a few days, when he had reached the 44th year of his age.

Kleist holds a high rank among the poets of his country. Before his time, it was doubted whether the German language was susceptible of that harmony and smoothness which appear in his poem "On the Spring," in which the beautiful scenes of nature are represented in a style equally conspicuous for its elegance and simplicity. In the later editions of this poem the author made numerous corrections, and added some new pieces. Two Latin versions of it have been published, and it has been translated into French, Italian, and English.

KLOPSTOCK, Frederic Theophilus, a very celebrated German poet, was born at Quedlinburg in 1724; was partly educated at home, and partly at the public school of his native place; and at the age of 16 was admitted to the college, where he soon became familiar with the language of the best classical authors. At this time also he employed his talents in composition, both in prose and verse, and produced some pastorals, which were then fashionable in the German academies. Even at this early period, it is said, he formed the resolution of attempting an epic poem, and actually fixed on the subject of the Messiah, by which his name has been transmitted to posterity.

When he removed to the university of Jena, he commenced the study of divinity; but he never lost sight of the great work which he had projected, and sketched his three first cantos. These cantos were composed in prose, because he was dissatisfied with the ordinary measure of German verse, and felt deeply the want of that melody which he admired in the strains of Homer and Virgil. In his attempts to discover some appropriate mode of versification, he determined to make trial of German hexameters, and

Knaresborough.

was so pleased with his success that he fixed upon this measure for the whole of his future poem. In the succeeding year he removed to Leipsic, and, being admitted a member of a literary society composed of young men devoted to poetry, he exercised his genius in lyrical compositions; and several of his odes, with the three cantos of his Messiah, appeared in the "Bremen Contributions," a work published by that society. These productions of his muse obtained for him great applause.

But the publication of ten books of his Messiah, a few years afterwards, spread his name and reputation throughout Germany; and although it did not altogether escape the shafts of criticism, it became extremely popular among those who were equally alive to poetry and devotion; and while young divines quoted it in the pulpit, graver theologians severely censured the fictions of poetry on sacred subjects.

Invited by some friends, he spent some time in Switzerland, and was so charmed with the sublime scenery of that country, and the frank simplicity of the inhabitants, that he had determined to spend the remainder of his days in a land where he was received with so many marks of regard and veneration; but the flattering offer of a settlement at Copenhagen, with a liberal pension, which was made to him at the suggestion of Baron Bernstorff, the Danish ambassador in France, who had been charmed with his poetry, changed his resolution, and in 1751 he set off for the metropolis of Denmark. In his way to that place he passed through Hamburgh, and became acquainted with a young lady of literary talents, and an admirer of his poetry, and who afterwards became his wife. This lady corresponded with Samuel Richardson, the English novelist, and some of her letters have been published in the third volume of a collection of his correspondence.

Till the year 1771, Klopstock resided chiefly at Copenhagen, and after this time he lived for the most part at Hamburgh, in the character of royal Danish legate, and counsellor of the Margrave of Baden, from whom he enjoyed a pension. The latter part of his life, which presents little variety, was occupied in occasional compositions, and in the collection and revision of his works. He died at Hamburgh in 1803, when he had reached the 79th year of his age.

Exuberance of imagination and sentiment strongly mark the character of Klopstock's poetry. His sublime conceptions are lost in mysticism, and his excess of feeling sometimes appears extravagant. His great work, the Messiah, which consists of twenty cantos, is not without prolixity and redundancy of ideas; but it places the author in the very first class of poets. The odes and lyric compositions of Klopstock are greatly admired by his countrymen; and his dramatic works, which are said to possess great force and dignity, are better adapted to the closet than the stage. His Grammatical Dialogues entitle him to the rank of a respectable prose writer, and are much esteemed for their judicious remarks on the German language.

KNARESBOROUGH, a town of the West-riding of Yorkshire, in England, is situated on an elevated bank of the river Nid, consists of two streets with excellent houses, and was long famous for its mineral waters and the fine scenery in the vicinity. The population exceeds 4000. Coarse linen and sheetings are the principal manufactures; the trade in corn is considerable; and a great deal of liquorice is cultivated in the neighbourhood. On the opposite side of the river a small chapel, of a Gothic character, cut out of the solid rock, is visited as a remarkable curiosity.

KNAUTIA, a genus of plants belonging to the Tetrandria class.

KNELLER, SIR GODFREY, a celebrated portrait painter, was born at Lubec in 1648. He was destined to the military profession,—but shewing early a strong passion for painting, he was sent to Amsterdam to receive instructions from Ferdinand Bol, and was also for some time under the tuition of the celebrated Rembrandt. For his improvement he visited Italy in 1672, and particularly devoted himself to the works of Titian, and Annibal Caracci. He resided some time at Venice, and was patronised and employed by some of the first families in that capital; and the history pieces which he produced about this time procured him some reputation.

Kneller visited England in 1675, and having been introduced to the duke of Monmouth, who sat for his picture, the production gave so much satisfaction that Charles II. was prevailed upon to permit his portrait to be taken by Kneller at the same time that he was sitting to Sir Peter Lely. The remarkable expedition with which he finished his work, and the strong likeness which he produced, fortunately met with the royal approbation, and finally determined him to fix his residence in England. He was appointed painter to the king on the death of Lely, was in equal favour with James II., and was still more distinguished by William III., from whom he received the honour of knighthood. He was continued in the same posts, and enjoyed the same honours, under Queen Anne and George I.

Kneller enjoys a high rank among portrait painters. The airs of his heads are very graceful, the drawings correct, the disposition judicious, and the colouring lively, true, and harmonious. But many of his works betray marks of great haste and carelessness. He acquired considerable wealth by his professional labours, and lived in a magnificent style in a country-house at Whitton near Hampton Court, and seems to have been on an intimate footing with the wits and poets of the time, most of whom have written in his praise. He died in 1723, when he had reached the 75th year of his age; and a splendid monument by Rysbrach is erected to his memory, with an inscription by Pope.

KNIGHTHOOD, a military order or honour, or a mark or degree of ancient nobility, or reward of personal merit. Four kinds of knighthood have been enumerated, namely, military, regular, honorary, and social. *Military* knighthood is that of the ancient knights who distinguished themselves in feats of arms, and were honoured with this dignity. They are called *milites*, to distinguish them from mere bachelors; and they were girt with a sword, and wore a pair of gilt spurs, and hence they were designated *equites aurati*. *Regular* knighthood is applied to all military orders which profess to wear a peculiar habit, to bear arms against the infidels, to succour and assist pilgrims in their passage to the Holy Land, and to serve in hospitals where they should be received. To this class belonged the knights Templars and the knights of Malta. *Honorary* knighthood is conferred by princes either on other princes or on their own subjects who have risen to high rank or favour in the state. In Britain the knights of the Garter, of the Bath, of the Thistle, and of St Patrick, belong to this class. *Social* knighthood is not fixed or confirmed by any formal institution or regulated by permanent statutes. Of this kind many orders have been established on occasion of tilts and tournaments, factions, and masquerades. Of all these orders Justiniani, in his History of Knighthood, has given a complete catalogue.

Origin.—Some authors have attempted to date the origin of the orders of knighthood at a very early period, and, although with little success, retrace it to the age of Abraham, Lot, and Laban; some fix it in the reign of Constantine the Great, who, it is said, being warned by a sign from heaven, instituted an order for the defence of the Christian religion; and the knights of St George, a powerful and numerous order, ascribe it to their patron saint, who, they assert, suffered martyrdom in Persia about the time of Dioclesian, but whose existence and history seem to rest chiefly on legendary tradition.

The real origin of the order of knighthood is to be sought for about the time of the Crusades in the twelfth century. According to the pious practice of the age, the merchants of Amalfi, who carried on a commercial intercourse with Judæa, built a church in Jerusalem, which, from the language and rites of the founders, long retained the name of the *Latin* church. For the accommodation of the sick and the pilgrims who visited the Holy Sepulchre, an hospital was built near the church, and endowed and dedicated to St John the Almoner. Increasing in wealth and influence, the hospitallers withdrew, first from the jurisdiction of the abbot of the Latin church, and finally, under the authority of the church of Rome, were rendered independent of the patriarch of Jerusalem. This happened about the year 1104.

The hospitallers joined the cause of the princes of the West; when the infidels had massacred the sick in the hospital at Jerusalem, the survivors of the order were compelled to retire to Italy; and having obtained a dispensation from Pope Innocent IV. absolving them from their original obligations, and permitting them to elect a grand master of a sound and vigorous constitution, some of the knights of St John of Jerusalem distinguished themselves by their military exploits, and the order itself rose high in reputation. The same order having occupied the island of Rhodes during the fourteenth and fifteenth centuries, its members were designated by the name of knights of Rhodes; and, from a similar connexion, they were afterwards known by the appellation of the knights of Malta.

The distinction acquired by the new orders, soon attracted others to share in similar honours. The canons regular of St Augustine, who superintended the holy sepulchre in the time of the Saracens, with the permission of Baldwin, assumed the title of knights of the Holy Sepulchre, and while the Christian kings held possession of Jerusalem were often conspicuous for their valorous deeds and martial exploits. When the infidels regained the occupation of the Holy Land, this order was incorporated with the knights of Rhodes.

In the succeeding year, 1119, the order of Knights Templars was established. The protection of the pilgrims who performed their devotions at the holy sepulchre was the professed object of the members of this order. The principal founders, Geoffrey of St Omer and Hugh de Paganis, and other pious men, grieved at the insults and oppressions which the Christians suffered from the infidels, united into a regular body, and bound themselves by solemn vows to protect the highways from robbers, and to be hospitable to the poor. Approved by Baldwin the king, and by the patriarch of Jerusalem, they erected an hospital near the temple of the sepulchre, and hence were called Knights *Templars;* the essential services which they performed to pilgrims in facilitating their access to the Holy Land, spread their fame throughout Europe; and, by the rich presents and valuable endowments which were conferred on the society, they became a powerful and wealthy order. The licentiousness of the Knights Templars, or the wealth which they possessed, is alleged as the cause of their downfal in 1312, at the instigation of the king of France and the Pope; and, whatever were their faults or their follies, they were persecuted and punished as the worst of criminals.

The Teutonic order derived its origin from a German nobleman, and was established about the same time as the Templars. He erected an hospital at Jerusalem for the use of his countrymen, whose language being unknown exposed them to much inconvenience. Having acquired wealth and importance, the German hospitallers were raised to the order of knighthood by Pope Celestine. They were invited to Europe by the Emperor Frederic II. for the purpose of establishing Christianity in the territories now occupied by Prussia, soon succeeded in becoming masters of the country, of which they held possession till 1525, when the last grand master, Albert of Brandenburgh, became feudatory to the king of Poland, by whom he was created duke of Prussia, and from him the present royal family of that name derive their right.

The struggles between the Moors and Christians in Spain long kept alive the spirit of chivalry, and gave rise to many orders of knighthood which finally merged in the crown.

KNOX, John, the great Scottish reformer, was a native of Gifford, near Haddington in East Lothian, was born in 1505, and, it is understood, was descended from a respectable family in Renfrewshire. Having completed the early part of his education at the grammar-school of Haddington, he commenced his academical course in 1524 at the university of St Andrew's, at that time in high reputation as a seminary of learning, and was fortunate in having John Major, a profound scholar, as his teacher in philosophy and theolgy, and not less so in having the celebrated George Buchanan as the friend and associate of his studies. With the zeal and activity of an ardent mind, young Knox soon became conspicuous for the progress he made in the learning of the times; and having been admitted to the degree of master of arts, he acquired great celebrity as a teacher of philosophy. He entered into clerical orders, and was ordained a priest before his 25th year, the requisite age according to the rules of the church.

The study of the earlier fathers of the church gave a new aspect to the views of the young divine, and, with the changes then in agitation, finally led to an entire revolution in his religious sentiments and future pursuits. Renouncing the intricacies of scholastic theology, he devoted himself more closely to the study of the sacred writings, and professed himself an adherent of the Protestant doctrines and form of worship about 1542. The change of his sentiments first appeared in his Lectures on Philosophy, and the suspicions of heresy thus excited were strengthened and confirmed by his public reprehension of the corruptions of the church. Having thus set himself in opposition to the established form of worship, he could not reside longer in safety at St Andrew's, where he was exposed to the persecution of Cardinal Beatoun, who declared him a heretic, degraded him from the priesthood, and, it is said, hired assassins to watch him in his flight, and to destroy him. Retiring to the vicinity of Edinburgh, he was taken under the protection of Douglas of Langniddrie, engaged as private tutor to his children, and occasionally preached in a chapel, the ruins of which, known by the name of John Knox's kirk, are yet visible.

Knox had now become a principal object of keen resentment to the adversaries of the new doctrines; and being compelled to consult his safety by frequent changes of residence, he had formed the resolution of retiring from his native country. But, at the suggestion of his protector and some other friends, he took refuge in the castle of St Andrew's, which was then in the possession of the conspirators against Cardinal Beatoun, and formed a safe retreat to many of the persecuted reformers; he was soon after chosen as colleague to the chaplain of the garrison; and in the course of a few months not only the garrison, but many of the inhabitants of the town renounced Popery, and made a public profession of the Protestant faith by partaking of the Lord's Supper after the manner of the reformed churches. The castle of St Andrew's capitulated to a French armament in 1547; Knox and his friends were conveyed to France as prisoners, and confined on board the galleys; and next year had the mortification of being in the same vessels when they were stationed on the coast of their native country, while the reformer himself suffered greatly in his health from severe treatment. After a confinement of 19 months he was set at liberty in 1549, and immediately repaired to England, where he attracted the notice of the English council, and was sent to Berwick as a Protestant preacher; two years after he was removed to Newcastle, was appointed one of the chaplains in ordinary to King Edward, and was in such favour with the young prince as to obtain the living of All-Hallows in London, and the offer of a bishopric, which latter he declined on account of the forms of church government.

The accession of Mary to the crown of England, and the re-establishment of the catholic form of worship by public authority, compelled the reformer to retire from the kingdom. He fled to France, and from that country repaired to Geneva, which became his ordinary place of residence during his exile, and where he formed a close friendship with Calvin; and some time afterwards he was invited to become one of the pastors of a congregation of English refugees at Frankfort-on-the-Maine; but a difference of opinion having arisen between Knox and some of the exiled English clergy on the subject of the liturgy, the former found it necessary to resign his charge and return to Geneva.

The progress of the reformation in Scotland seemed now to offer a favourable opportunity for him to revisit his native country. He returned in 1555, and having arrived secretly in Edinburgh, continued for some time to preach privately to the reformers assembled from different parts of the country in the metropolis. Part of his time was also occupied in visiting the nobility and gentry, in different counties, who were friendly to the cause in which he was engaged. But the state of affairs in Scotland was not such as to encourage him to remain in his native country. Having accepted of an invitation to take the pastoral charge of the English congregation at Geneva, he set out for that place in 1556, accompanied by his wife, whom he had married at Berwick before his first departure from England; and two years of his life were agreeably spent in this situation, till the pressing invitations from the Protestant lords of Scotland prevailed with him to return to join them in the struggle for religious liberty.

When he arrived in the kingdom in 1559, the sentence of outlawry which had been formerly pronounced against him was published; but without hesitation he hastened to Stirling, which was appointed as the place of trial of the Protestant ministers; and on the invitation of the Protestant lords, who had determined to adopt the reformed worship in public whereever their influence extended, he met them at St Andrews, preached in the cathedral, and prevailed with the magistrates and inhabitants to join in the formal abolition of the popish service. He accompanied the forces of the congregation to Edinburgh, where a similar reformation was effected; but as the Regent's army took possession of the city, he retired from it, and, in the course of two months, travelled over the greater part of the kingdom, preaching and confirming the interests of the Protestants in every place that he visited.

The conspicuous character of Knox, and the influence which he possessed over the measures of the times, may be readily inferred from the conference which he had with the young queen, a few days after her arrival in the kingdom, obviously for the purpose of soothing him into moderation, or of awing him into submission. But the unrestrained freedom of his remarks in vindication of the course which he had pursued, soon shewed that the bold character of the reformer was not to be conciliated or subdued by the smiles of royalty or the frowns of authority. In the cause which he had undertaken, his zeal and influence continued unabated both in his private exertions and in his public appearances in the pulpit.

Of his labours in the latter capacity some estimate may be formed, when it is known that he preached twice every Sunday, and thrice at least throughout the week, besides the punctual performance of every other part of his ministerial duty. An attempt which he and his friends made, in 1563, to obtain from Parliament the ratification of the treaty made in 1560, and the establishment of the Protestant religion, failed; but a public protest was entered into against the queen's marriage with any person attached to the catholic worship. The active interference of Knox naturally excited the indignation of Mary; and this feeling was farther increased by a circular letter which he wrote to the leaders of the Protestants, requesting them to repair to Edinburgh, to oppose the prosecution of some persons who had offered insults to her priest at the palace. Knox was summoned before an extraordinary convention, to take his trial for the offence, which was declared to be a treasonable act; but his judges were Protestants, and had themselves resisted the queen's authority, so that he was unanimously acquitted of the charge.

In the struggle for power, and in the view of accomplishing certain purposes not directly avowed, it has been no unusual thing for mankind, in almost all ages, to mingle together the affairs of religion and politics, in which the strongest feelings of human nature are brought into action. This practice has prevailed from the time of Knox to the present day in addresses from the pulpit. Of this a striking example is recorded, when the marriage of the queen took place in 1565, and Lord Darnley was advised by the Protestants about the court to hear Mr Knox preach, in the hope that, by this step, he would secure the good will of the people. Darnley complied, and was so much offended at the sermon, which was indeed in a great measure addressed to himself, that he complained to the council, and out of complaisance to the queen's consort the preacher was silenced for some time. The text itself had a striking allusion to the state of affairs, and in some of the topics of discourse Knox enlarged on the government of wicked princes, who for the sins of the people are sent as tyrants and scourges to punish them; "and sometimes," he added, "God sets over them, for their offences and ingratitude, boys and women."

Of the leading part which Mr Knox had in conducting the affairs of the church, an instance appears in the meeting of the general assembly, about the close of the year 1565, when he was appointed to draw up a consolatory letter in their name, to encourage the ministers to persevere in the exercise of their functions, when they were labouring under great discouragement from the scanty means of their subsistence; and when he went on a visit to England, he was the bearer of a letter from the assembly to the bishops, soliciting indulgence for the English puritans, who had been severely treated. He was selected in the year 1567 to preach the sermon at the coronation of James VI., which took place at Stirling; at the close of the same year he preached a zealous sermon at the opening of the convention of all the estates; and, indeed, it may be added, that on all public occasions he was called upon to discharge a similar duty.

The murder of the regent Murray, in 1569, and certain changes in the political aspect of affairs, or in the prevailing power of opposite parties, rendered more than ordinary vigilance necessary in consulting for the safety of his person. By the advice of his friends he retired from Edinburgh, and remained at St Andrews till August 1572. In this year a convention, composed of the leading men among the ministers, and a committee of privy council, was held at Leith; and at this meeting it was agreed, that a kind of episcopacy should be introduced into the church. With certain modifications the plan was approved of by the General Assembly, and in a letter addressed to the assembly by Mr Knox, some of the regulations relative to the election of bishops met with his approbation, from which it appears that the reformer had relaxed somewhat in his zeal for the simple form of presbyterian church government.

The state of the country having permitted those to return to Edinburgh who had been compelled to leave it on account of the troubles of the times, Mr Knox was invited to resume his ministerial functions; but in complying with this invitation he found it necessary to enter into a previous stipulation, that he should be at full liberty to address them according to the dictates of his conscience; and from the terms thus proposed, it would appear, that the sentiments he expressed were not always perfectly agreeable to his hearers. For a short time he continued to preach to his former congregation; but his health was visibly on the decline, and a constitution naturally robust was nearly exhausted by an unwearied application to study and to business, as well as by the frequency and fervour of his public discourses. In his last illness he discovered great fortitude, and he met the approaches of death with that magnanimity which forms so striking a feature in his character. He died in 1572, when he had reached the 67th year of his age. His mortal remains were followed to the grave by all the respectable characters in Edinburgh, as well as by several of the nobility, and particularly by the earl of Morton, the regent of the kingdom, who, as soon as the body was committed to the earth, said, "There lies he who never feared the face of man."

The character of the reformer has been generally admitted to be correctly drawn by Dr Robertson, the elegant historian of Scotland. "Knox was the prime instrument of spreading and establishing the reformed religion in Scotland; zeal, intrepidity, disinterestedness, were virtues which he possessed in an eminent degree. He was acquainted, too, with the learning cultivated among divines in that age; and excelled in that species of eloquence which is calculated to rouse and inflame. His maxims, however, were often too severe, and the impetuosity of his temper excessive. Rigid and uncomplying himself, he shewed no indulgence to the infirmities of others. Regardless of the distinctions of rank and character, he uttered his admonitions with an acrimony and vehemence more apt to irritate than to reclaim. This often betrayed him into indecent and undutiful expressions with respect to the queen's person and conduct. Those very qualities, however, which now render his character less amiable, fitted him to be the instrument of Providence for advancing the reformation among a fierce people, and enabled him to face dangers from which a person of a more gentle spirit would have been apt to shrink back."

Beside some other works, Mr Knox was the author of a History of the Reformation of Religion in Scotland, which was published after his death, in folio; and he left behind him many manuscripts, which were formerly in the possession of Mr Wodrow, the author of the History of the Church of Scotland, and are now, it is understood, deposited in the library of of the university of Glasgow.—*M'Crie's Life of Knox.*

KNOXIA, a genus of plants belonging to the Tetrandria class.

KNUTSFORD, a town of Cheshire in England, contains between 2000 and 3000 inhabitants, many of whom are occupied in extensive cotton works, or at a silk mill, and in the manufacture of sewing thread and velvet.

KOLIVA, or KOLHYVAN, a village in the district of Kusnetz in Russia, is chiefly remarkable for the silver mines in the chain of the Altaian mountains, and between the rivers Oby and Irtish. The ore was formerly smelted at the village of Koliva, but in consequence of the scarcity of wood the operations have been removed to other places. A portion of gold is also found in the same ores.

KOLYMA, or COVIMA, a large river of the government of Irkutsk in Siberia, has it source in the lofty mountains which border the Eastern ocean, and, after a course of more than 1200 miles, discharges its waters by two branches into the Frozen ocean. This river abounds with fish, particularly with salmon; and the Russians have several stations along its banks. Organic remains, as the tusks of large animals, have been dug out of the sandy banks of the river, and the shores of the Frozen ocean.

KOENIGIA, a genus of plants belonging to the Triandria class.

KONGSBERG, or KONISBERG, a town of Norway, which stands on the banks of the river Lowe, and contains about 6000 inhabitants, many of whom are employed in the celebrated silver mines in the vicinity. The annual produce of these mines has been estimated at different periods from L.50,000 to L.79,000.

KONIGSBERG, a sea-port town of Prussia, is situated on the river Pregel, which is crossed with seven bridges, to facilitate the communication with different parts of the town. The ramparts for the defence of the place are about seven miles in circumference; and among the public buildings may be mentioned the university, which was founded about the middle of the 16th century. The number of inhabitants is stated at 54,000, and the chief manufactures are woollen stuffs, stockings, ribbons, gloves, sail-cloth, soap, pottery, and ornamental objects of yellow amber, which latter substance is a native production of the shores of the Prussian territory. Konigsberg was formerly one of the Hanse towns, and has been always distinguished for its commercial enterprise. But although the river Pregel is navigable, it admits vessels only of a small draught of water. For large ships, Pillau is the proper port of Konigsberg, at which 600 or 700 ships annually arrive from the Baltic.

KOOM, a city of the province of Irak in Persia, is situated on the banks of a river, in an extensive plain; contained at one time 15,000 inhabitants, and was celebrated for the manufacture of silks, as well as for the splendour of some of the public edifices. The tombs of some of the Mahometan saints are still objects of veneration, and are visited by pilgrims from distant parts of the empire.

KORAN, or ALKORAN, denoting the Scripture or Bible of the Mahometans, is a word compounded of the Arabic particle *al* and *koran*, derived from the verb *to read*, and therefore literally signifies the reading, or that which ought to be read. The Koran is divided into 114 larger portions or chapters, of very unequal length, and in the manuscript copies they are distinguished, not by numerical order, but by particular titles, which are taken sometimes from a particular matter treated of, or from a person mentioned in it, but usually from the first word of note, although the word from which some chapters are denominated be towards the middle or near the end of the chapter. The reason of this is alleged to have been, that the verse or passage in which such word occurs, was revealed and committed to writing before the other portions. Every chapter is divided into smaller portions, also of very unequal length.

Beside the unequal divisions of chapter and verse now alluded to, the Mahometans have divided the Koran into 60 equal portions, and each of these is subdivided into four equal parts. This has been stated as an imitation of the Jews, who have an equal division of their scripture into 60 portions. But the Koran is more usually divided into 30 sections only, each of twice the length of the former, and in like manner subdivided into four parts. This mode of division is for the accommodation of the readers of the Koran in the royal temples, or in the adjoining chapels, where the emperors and great men are interred. Thirty of these readers being appointed to each chapel, each reads his prescribed section daily, so that the whole Koran is read over once every day.

Next, after the title at the head of every chapter, with the exception of the ninth, is prefixed the solemn form, called by the Mahometans, Bismallah,—in the name of the most merciful God. This form is generally observed at the commencement of their books and writings as a distinguishing characteristic of their religion. But similar forms, it will be recollected, were in use among the Jews and eastern Christians.

Twenty-nine chapters of the Koran begin with certain letters of the alphabet, some with a single letter, others with more. The Mahometans believe these letters to be the peculiar marks of the Koran, and to conceal certain profound mysteries, the meaning of which has been revealed only to the prophet. In attempts to explain these letters, it has been supposed that they stand for as many words, expressing the names and attributes of God, his works, ordinances, and decrees, or that the explanation is to be sought from their nature or origin, or from their value, when employed to express numbers. This mode of interpretation, it is obvious, opens a wide field for conjecture.

The Koran is very generally admitted to be written with the utmost elegance and purity of language, in the dialect of the tribe of Koreish, the most noble and polite of all the Arabians, and rarely with any mixture of other dialects; and hence it is regarded as the standard of the Arabic tongue. The general design of the Koran is supposed to have been to unite, in the knowledge and worship of one God, those professing the three different religions then known in the populous country of Arabia, the greater part of whom was attached to idolatry, and the rest were Jews and Christians, having corrupt notions of doctrine and practice. This union was to be effected under the sanction of certain laws, and the outward signs of ceremonies, partly of ancient and partly of later appointment, enforced by the consideration of rewards and punishments, both temporal and eternal,—and to bring them all to the obedience of Mahomet as the prophet and ambassador of God, the chief pontiff in spiritual matters, and the supreme prince in temporal affairs.

The unity of God is the great doctrine of the Koran; the restoration of which Mahomet declared to be the chief end of his mission. He assumed it as a fundamental truth, that there never was nor ever can be more than one true orthodox religion; and he taught, that whenever this religion became neglected or corrupted, God had the goodness to inform and warn mankind of their errors by several prophets, of whom Moses and Jesus were the most distinguished, till the appearance of Mahomet, who is their seal, and no other to be expected after him. To draw attention, great part of the Koran is employed in relating examples of dreadful punishments inflicted by God on those who rejected and abused his messengers. These instances are either partially or wholly taken from the Old or New Testament, from the Apocryphal books, or from the traditions of the Jews and Christians. The rest of the Koran is occupied in prescribing necessary laws and directions, frequent admonitions to moral and divine virtues, the worship and reverence of the Supreme Being, and resignation to his will.

According to the orthodox belief among Mahometans, the Koran is eternal and uncreated, and the first transcript has been from everlasting by God's throne, written on a table called the Preserved Table, on which are also recorded the divine decrees, past and future. A copy from this table, in one volume, on paper, was, by the ministry of the angel Gabriel, sent down to the lowest heaven, from whence Gabriel revealed it to Mahomet by portions, some of which he received at Mecca, during the period of twenty-three years; but he had the consolation of seeing the whole once every year, and in the last years of his life he saw it twice. It is farther believed that few chapters were delivered entire, the most part being revealed by piece-meal, and written down from time to time by the prophet's amanuensis, and, according to the directions of the angel, exactly in that part of the chapter which they were destined to occupy when it was completed.

The revelations of Mahomet were digested and arranged by his successor, Abubeker, who ordered the whole to be collected, not only from the palm-leaves and skins on which they had been written by the followers of the prophet, but also from the mouths of such as had committed passages to memory; and this transcript, when it was completed, was committed to the custody of Hassa, the daughter of Omar, one of the widows of Mahomet. From the share which Abubeker had in arranging the Koran, he is generally imagined to have been really the compiler.—See Sale's *Koran*.

KORAQUAS, a tribe of Hottentots who inhabit a district on the confines of the Namaqua country in Southern Africa, are said to be taller than the other Hottentots of the colonies; but, having the same language and customs, are obviously descended from the same race. The long droughts that prevail in their territory, and the consequent want of water, render them a migratory tribe.

KORIACS, a people inhabiting the northern regions of Kamschatka, and all the coast of the Eastern ocean as far to the northward as it is habitable. They are divided into two tribes, the rein-deer or wandering Koriacs, and the fixed Koriacs. The first tribe, as the name indicates, is migratory, and roams about in an extensive tract of country with their rein-deer, in search of the moss, which is the chief food of those animals. This race never frequents the sea or lives on fish. The fixed Koriacs have a few rein-deer, which they employ in sledges. They are a timid race, and are in some degree kept in a state of servitude by the other tribe. Both tribes, as appears from their features, are the offspring of Tartars.

KOUMISS, a kind of wine prepared from milk in Tartary, where it is used by the natives as their common beverage when it can be had, and sometimes serves them instead of other food. It is usually prepared from fermented mare's milk; or, when that is scanty, with a certain proportion of cow's milk. In the preparation of this liquid, a certain quantity of water, a sixth part, is added to the mare's milk. The mixture is put into a wooden vessel, into which an eighth part of sour cow's milk, or a small portion of old koumiss, is poured. The vessel is covered with a thick cloth, and set in a moderately warm place, allowed to rest for 24 hours, when a thick substance collects on the top; the whole is then churned and brought to a uniform consistence. It then remains at rest for 24 hours, is again agitated till the liquor appear of the same uniform consistence; and in this state it is called koumiss, which, to the taste, has an agreeable mixture of sweet and sour. This liquid has been employed medicinally, and, it is said, with great success in the cure of nervous complaints and hectic fevers; but it is probable its effects in this way are over-rated. From this acid liquor an ardent spirit is obtained by distillation.

KRAKEN, an animal supposed to have been seen at sea, of so huge a size as to have the appearance of several islands rising from the surface of the water. In the existence of this animal the weakness and credulity of fishermen have excited the belief, even among respectable naturalists; and among others it is described by Bishop Pontoppidan, in his Natural History of Norway. It can scarcely be doubted, that the whole depends on certain optical appearances arising from a peculiar state of the atmosphere, which thus exhibits to the fancy something of the form of a large animal.

KRISHNA, a river of India, which has its source near the foot of the Western Ghauts.—See HINDOSTAN.

KUNCKEL, JOHN, a celebrated chemist, was born in 1630, in that part of the duchy of Sleswick which belonged to the duke of Holstein Gottorp. By his skill in chemistry and the mechanical sciences, he procured the favour of different princes, and was enabled to sustain himself in Saxony, where he delivered, in 1676, private lectures on chemistry. He was entrusted with the care of the famous laboratory at Annaburg belonging to the elector of Saxony; and being invited to Berlin in 1678, by Frederick William, elector of Brandenburg, to be chemist to the court, he acquired great celebrity by his chemical researches, and particularly by his discovery of phosphorus, although it is asserted that this substance was known to Fernelius, first physician to Henry II. king of France, while others ascribe the discovery to an Italian, and some maintain that the secret was communicated both to Kunckel and Kraft, by Brandt, a chemist of Hamburgh. Kunckel was afterwards invited to Sweden, was appointed by the king counsellor of mines, and raised to the rank of nobility. He died in 1702. His works, written in German and Latin, chiefly treat of chemical subjects, and are not altogether free from the prevailing spirit of alchemy.

KUR, KOURR, or CYRUS, a river of Asia which has its origin in Armenia, and being enlarged by several tributary streams, keeps a northerly course, then runs eastward through the plain between the mountains of Caucasus and part of Ararat, and meeting with another ridge turns to the southward, and discharges its waters by several branches into the Caspian sea.

KURILE ISLANDS, a groupe or chain of islands extending from cape Lopatka, the southern extremity of Kamschatka, to Jesso, and between the 45th and 51st degrees of north latitude. The number of these islands is not exactly ascertained. The Russians, who have annexed them to their conquests in these regions, have given names to 25; but they are usually designated by their position, and, beginning at the north, are named first, second, third. The shores of the different islands are in general precipitous, and the surface presents naked mountains. No trees appear on some of them, and where wood grows it is extremely stunted.

When these islands were visited by La Perouse in 1787, four only were inhabited, and the whole population, it was supposed, did not exceed 1400. The inhabitants are chiefly occupied in fishing and hunting, and the animals which are the objects of the chace, are foxes, bears, and sea-otters. The only intercourse which the natives have with other countries is with the Russians, who claim the superiority of the northern part of the chain, and with the Japanese, who have formed settlements on some of the

Kurtus.

islands to the southward. The unfavourable reception which the Russian embassy experienced at Japan in 1807, provoked them to an attack on the Japanese settlements in the Kurile islands. Two armed vessels, which were dispatched from Kamschatka for that purpose, returned with considerable booty in arms, books, maps, and lacquered utensils, and in rice, salt, and tobacco.

KURTUS, a genus of fishes belonging to the order Jugulares.

Kuzistan.

KUZISTAN, the ancient *Susiana*, is a province of Persia, having the Persian gulph and the Tigris for its boundary on the south and west, and the territory of Bagdad and the river Tab on the north and east; a great extent of the surface consists of morasses and sandy plains; but wheat, barley, rice, and oats are enumerated among the cultivated productions. The towns, some of which are of great antiquity, contain from 15,000 to 600 or 700 inhabitants.

L.

Laaland ‖ Labrador.

L is the eleventh letter of the English alphabet, and is a semivowel or liquid. It is derived from the old Hebrew letter *lamed*, or the Greek *lambda*. This letter is sounded by intercepting the breath between the point of the tongue and the fore-part of the palate, with the mouth open. The sound has something of an aspiration. In English words of one syllable it is doubled at the end, as *tell*, *bell*; but in words of more syllables than one it is single at the end, as *evil*, *general*. It never stands before a consonant, but is placed after most of the consonants in the beginning of words and syllables, as *black*, *glare*, *eagle*. It has a clear sound in *Abel*, but obscure in *able*.

When used as a numeral letter, L signifies 50, and with a dash over it thus, L̄, it denotes 5000. As an abbreviation L. stands for Lucius, and LL.S. for Sesterce, a denomination of Roman money, and L.L.D. for Doctor of Laws.

LAALAND, an island of Denmark, which is chiefly remarkable for the fertility of its soil, which produces abundant crops of grain, the superabundance of which beyond the supply of the inhabitants enables them to export it to Copenhagen and other parts of Denmark. It contains 17 towns, distributed on the coast or in the interior districts.

LABDANUM, or LADANUM, a resinous juice which exudes from the leaves of a species of cistus. See CHEMISTRY and MATERIA MEDICA.

LABORATORY, an apartment furnished with all kinds of apparatus necessary for conducting chemical operations. Laboratories, it is obvious, must be of different kinds, according to the nature and extent of the operations to be performed. For experimental purposes, a single portable furnace or two will be found sufficient; but it is necessary to add, that shelves are indispensable for holding vessels with the products of the different operations, for, if confusion and disorder be not avoided, the products of these operations might be lost or mistaken for one another. But from a knowledge of the methods of performing the different chemical operations, it will be easy to direct the arrangement of a laboratory, and to select all the necessary utensils and vessels.

Labrador.

LABRADOR, a peninsular region of North America, which forms the eastern boundary of Hudson's bay. The boundaries on the north and east are Hudson's strait and the Atlantic ocean, and Canada and the gulph of St. Lawrence on the south. The discovery of this territory in 1496, is ascribed to the Portuguese, from whom it derived the name of Terra de Labrador, or "Ploughman's Land," for what reason is not easy to surmise. New Britain is another name of Labrador, and the west coast is known among the settlers of Hudson's bay under the name of East Main. Labrador extends from the 50th to the 60th degree of north latitude, and a ridge of mountains stretches along the eastern shore from the 54th to the 59th degrees, some of whose summits reach to the height of 3000 feet above the level of the sea.

The surface of this region presents a dreary aspect of bare rocks, almost destitute of herbage, or covered with moss or plants of diminutive growth, or producing in the sheltered vallies a few stunted trees of birch and pine. Numerous lakes, supplied by the rains or melting snow, are dispersed over the country. The rivers are of trifling magnitude, affording an outlet to the redundant waters of the lakes. From what is known of the rocks of Labrador, the prevailing strata seem to belong to the primitive class. As the name indicates, the beautiful Labrador felspar is found in detached masses on the shores of lakes, or of the ocean, in this country. The climate of this inhospitable region is extremely rigorous during the greater part of the year.

Among the animals of Labrador are enumerated bears, wolves, foxes, beavers, martins, ermines, and rein-deer, some of which are destroyed for the sake of the fur; eagles, hawks, owls, ptarmigans, are described among the permanent inhabitants of the feathered tribes; and numerous migratory birds make the woods and shores of the lakes their temporary abode during the breeding season.

Labrador is thinly inhabited by a very diminutive race of people. The Esquimaux, similar to those of Greenland, occupy the sea-coasts and are chiefly employed in fishing. The inhabitants of the interior districts resemble the Indians of Hudson's bay in dress, manners, and customs. The hunting of those animals which afford furs, forms the principal object of their industry; and the furs are exchanged with the Canadian traders for blankets, fire arms, ammunition, and ardent spirits.

Some parts of Labrador have been visited by missionaries from the Roman catholic establishments in Canada; and, as the fruit of their labours, feeble traces of Christianity are yet visible among the inhabitants. But, for more than half a century, the zeal and perseverance of the Moravian missionaries have been indefatigable in the civilization of that people, and in diffusing the blessings of revealed religion. Three settlements are formed on the coast, and one half of a population, amounting to 600, is under the superintendance of twenty-five missionaries.

LABRUS, Wrasse, or Sea-Tench, a genus of fishes belonging to the order Thoracici. See Ichthyology.

LABYRINTH, derived from the Greek, and signifying a circumscribed space, intercepted by numerous passages crossing each other in all directions, was applied by the ancients to natural caverns or structures artificially formed, some of which acquired great celebrity either from fabulous or real history. The labyrinths of Egypt and Crete were the most famous: But the accounts of them detailed by ancient authors are obviously exaggerated, or derived altogether from fabulous history. The construction of the Cretan labyrinth is ascribed to Dædalus, whose existence is blended with fable, and whose name it has been observed, like that of Hercules, became the resource of ignorance whenever it turned its eyes on the early ages. For all great labours, all works that required strength and ingenuity, were attributed to Hercules, and such as had a relation to the arts, and required a certain degree of intelligence in the execution, were ascribed to Dædalus. It has been alleged, with much probability, that these labyrinths were at first partly excavated by nature; that in some places stones were extracted from them for building cities; and that in more ancient times they served for a habitation or asylum to the inhabitants of districts exposed to frequent incursions. According to some ancient historians, the people of Crete originally dwelt in the caves of mount Ida, and at this place some travellers have fixed the ancient labyrinth; and the answer to inquiries made by travellers on the spot was, that the labyrinth was employed in former times as a prison. See *Travels of Anacharsis*.

LAC, or LACCA, a substance formed by an insect, *coccus lacca*, on trees in the East Indies. Four different kinds of this substance are known in commerce, namely, stick-lac, which is the lac adhering to the small branches of the tree; seed-lac, which is the stick-lac, separated from the wood, grossly powdered, and deprived of its colouring matter by solution, to be employed as a dye-stuff; lump-lac, which is the stick-lac freed from impurities by melting it with heat, and forming it into cakes; and shell-lac which consists of the cells melted, strained, and formed into thin transparent plates. Lac is employed for making sealing-wax, for japanning, varnishing, and dyeing.—See Chemistry and Dyeing.

LACCADIVE ISLANDS, a numerous groupe of islands in the Indian ocean, the nearest of which is 75 miles from the Malabar coast. See Hindostan.

LACE, a fine kind of net-work, which is employed for the ornamental parts of female dress, and consists of six-sided meshes, which are formed by twisting together threads of silk, flax, or cotton. In this manner the ground of the lace is made; but when ornaments are added according to some design, they are formed of thicker threads woven into the net.

Different kinds of lace are described, and they are distinguished by the names of the places where they are manufactured, or from some diversity in the fabric, as Buckinghamshire or Bedfordshire lace, which is also denominated pillow or bobbin lace, because it is woven by means of bobbins on a cushion or pillow. But this lace is now made by machinery, and is called bobbin-net. Four of the six sides of the bobbin-lace are formed by twisting two threads round each other, and the other two sides are formed merely by the crossing of two threads. The Lisle lace is of this description. In Honiton lace, so called from the name of the place where it is made in Devonshire, two sides of each mesh are plaited with four threads, and four other sides by threads twisted together. This lace is the same as Brussels lace. The Valenciennes lace, which is much sought after, has all the six sides of the mesh plaited, but two of them are so small that it appears like a lozenge.

The pillow or bobbin-lace, which is made by women or children, is so called because the threads are wound upon small bobbins of light wood; and the work is conducted on a pillow or cushion, on which is fixed a piece of parchment, pierced with pin-holes, to shew the places for the pins, round which the threads are woven and twisted together to form the meshes; and on the same parchment is traced the design, to guide the operator in introducing the thick threads between the fine threads that form the net-work.

A machine, on the principle of the stocking-frame, and called the point-net frame, was invented at Nottingham by Mr Morris more than 50 years ago. The lace manufactured by this machine is formed of one continued thread; but it has been objected to this kind of lace, that although the imitation be at first very beautiful, yet, after being washed, it becomes loose and irregular; and when a thread breaks, the work unravels like a stocking.

In the warp-frame, which is also constructed on the principle of the stocking-frame, the lace is formed, not of one thread, but of as many different threads as the number of needles in the frame, and the threads are warped or wound on a roller or beam, as in the weaving-loom. The fabric of the warp-lace is more permanent than that of the point-net; for the sides of the meshes are made of two or three loops of chain-work drawn through each other, so that it is less liable to unravel. The loops resemble the plaited sides of the Brussels lace, but different patterns may be produced on the warp-frame. In these machines, net is woven to the breadth of a yard and a half, which is afterwards divided into pieces of the requisite breadth; for which purpose a row of wide meshes is formed at the proper row or division. Plain net-work only is woven in the frame; the addition of ornaments is made with the needle; and when this is required, the entire piece is stretched in a frame similar to what is used for tambour-work.

Ingenuity has been long occupied in the construction of a machine for weaving the real twisted lace, and numerous patents have been obtained for this purpose. Mr Morris, the inventor of the point-net frame, contrived an apparatus with this view. But the most perfect machinery was invented by Mr Heathcot in 1808; and it was still farther improved in the succeeding year, so that he could make lace of any required breadth. By a later improvement, figures or flowers are introduced at the same time that the lace is made.

LACEDÆMON, or SPARTA, the capital of Laconia, was situated on the banks of the river Eurotas, and at the bottom of Mount Taygetus, is stated by ancient writers to have occupied a great extent of ground, and is supposed to have been founded 1500 years before the Christian era. The Spartan republic seems to have been one of the most considerable of the Grecian states at an early period, and became afterwards still more conspicuous on account of the singular system of education introduced by the laws of Lycurgus, and of the celebrity which it acquired by warlike exploits. See GREECE.

LACERTA, LIZARD, or CROCODILE, a genus of animals belonging to the order of Reptiles. See ERPETOLOGY.

LACHNEA, a genus of plants belonging to the Octandria class.

LACK, a term applied in India to money of account, as a lack of rupees, which is 100,000; and supposing the rupee to be equal to two shillings and sixpence, this sum would amount to L.12,500 Sterling.

LACONIA, a territory of Peloponnesus, which is watered by the river Eurotas, and of which Sparta or Lacedæmon was the chief town. The people of this state are said to have been remarkable for the brevity with which they spoke; and hence gave rise to the term *laconic* expression, denoting what is said very concisely, or in the fewest words; but, in the modern application of the term, something seems to be conveyed of the manner of saying a thing, as well as of what is said.

LACQUER, a kind of varnish, applied to brass and other metals, to prevent them from tarnishing, and to improve the colour. See VARNISHING.

LACTANTIUS FIRMIANUS, or LUCIUS CŒLIUS, one of the Christian fathers, is supposed by some to have been a native of Italy, but, according to others, was born in Africa about the close of the third century, and it is said was invited by the emperor Dioclesian to teach rhetoric in Nicomedia. In his advanced age he was engaged as tutor to the son of Constantine, and for the purpose of instructing his pupil in the Latin language he resided for some time in Gaul. But in these employments, although he seems to have enjoyed the smiles of royalty, it is understood that he spent the greater part of his life in indigence. He was the author of several treatises written in elegant Latin; and as he has successfully imitated the great Roman orator in purity of language, elegance of style, and eloquence of composition, he has obtained the distinguished appellation of the Christian Cicero. His principal work, *Institutionum Libri Septem*, is devoted to a defence of Christianity; *De ira Dei* displays a great deal of profound learning, and the author endeavours to prove, that the Supreme Being is capable of anger, as well as of compassion and mercy; and, in the treatise, *De Opificio Dei*, he establishes the doctrine of the providence of God, by demonstrating the excellence of his principal work, which is man, and giving an elegant description of the human body, and of the powers and faculties of the soul. Some other treatises, on doubtful authority, have been ascribed to the same author. The first edition of his works was published at Rome in 1468 in folio; and the most correct edition appeared at Paris in 1748, in 2 vols. 4to.—Lardner's *Credibility, &c.* Vol. VII.

LADOGA, one of the largest lakes of Europe, lies between the head of the gulph of Finland and Lake Onega, and is very subject to severe storms, which, with the shifting sand banks near its shores, greatly interrupt the navigation. A canal, projected and begun by Peter the Great, is conducted along its southern shore; and thus a communication is formed between the Baltic, this lake, and Onega, and the adjoining rivers, by which trade is carried on throughout these extensive regions.

LADRONE, or MARIANNE ISLANDS, a groupe of twelve or fourteen islands in the Pacific ocean, lying between the 11th and 21st degrees of north latitude, and near the 145th degree of east longitude, and discovered in 1521 by Magellan; but were not settled till 1668, when Mary-Anne of Austria, the widow of Philip IV. of Spain, sent out missionaries for the instruction of the natives in religion, and their conversion to Christianity; and hence the islands received the name of Marianne, while the first name was imposed by the discoverer to characterize the pilfering practices of the natives. A military establishment was afterwards formed in the Ladrones, and all the islands were reduced under the authority of Spain.

Of the whole groupe, three or four of the islands only are inhabited. If the estimate be not exaggerated, it must appear scarcely credible that a population of 60,000 should be reduced to less than 2000; but it seems probable that the statements are not very accurate. The jealousy of the Spaniards precludes free communication; and in the transient visits of voyagers from other European countries, little precise information can be obtained. Guam and Tinian are the principal islands of the groupe that have been visited.

Guam is the largest of the groupe, is about 40 miles in length; appears to be flat, and on the west side is skirted by low sandy bays, while the east side opposes to the sea a barrier of precipitous rocks.

The harbour of Umata, defended by a battery, is on the west side of the island, and affords commodious and safe shelter to a few vessels.

The vegetables and fruits common to tropical regions are abundant. The bread-fruit tree was first discovered by Dampier in this island. The cattle introduced by the Spaniards have not only increased greatly, but, like the wild cattle of Europe, have returned to their original white colour, with the tips of the ears black. The surrounding seas abound with turtle and fish, many of the latter of which, perhaps erroneously, are said to be poisonous.

The inhabitants are settled in villages on the coast. They have been greatly celebrated for the construction and management of their prows and canoes, and have been instructed by their European masters in some of the arts of civilized life. The culture of rice, sugar, indigo, and cotton, has been introduced. The town of Agana, the seat of government, is twelve miles distant from the harbour of Umata; the houses are constructed chiefly of wood, excepting the public buildings, which are of brick. The church, and several convents, are monuments of the zeal and activity of the Jesuits, by whom they were originally established, as well as a college or seminary destined for the education of the Indians.

Tinian, which is about twelve miles long, and is the only other island of the groupe much known, is represented, in the glowing description of the writer of Anson's voyage in 1742, as a paradise, exhibiting every thing that could please the eye or gratify the taste. But at no great distance of time, when visited by other voyagers, it seems to have changed its character, as appears from the accounts of Byron and Wallis. This diversity of aspect may be in some measure reconciled by taking into consideration the different feelings of the visitants, and the different season of the year; and perhaps not a little is to be ascribed to the writers themselves running into opposite extremes in their descriptions. Under the same latitude, where the soil, climate, and other features are nearly the same, every island and every country must exhibit much of the same character in its aspect and productions.

LAGERSTROEMIA, a genus of plants belonging to the Polyandria class.

LAGŒCIA, WILD CUMIN, a genus of plants belonging to the Pentandria class.

LAGURUS, HARE'S TAIL GRASS, a genus of plants belonging to the Triandria class.

LAHORE, an extensive province of Hindostan, is bounded by the Indus on the west, Cashmere on the north, and Delhi and part of other provinces on the south. Lahore is also the name of the capital of the province. See HINDOSTAN.

LAKE, a collection of water in the interior of a country, and having no communication with the ocean, and hence sometimes called an inland sea. See *Hydrography*, under GEOLOGY.

LAKE, the colouring matter of any substance precipitated from its solution along with aluminous earth, by means of an alkali. Thus the colouring matter of madder, or turmeric, being dissolved in water, by boiling with a portion of salt of tartar or potash, and to this solution a strong solution of alum being added, a precipitate is formed, which being separated by filtration forms a lake of madder or turmeric.

LALANDE, JOSEPH JEROME LE FRANCAIS, an eminent French astronomer, was a native of the department of Ain, and was born in 1732; and at the early age of six may be said to have commenced the study of astronomy, or at least to have shewn a predilection for investigations of that nature; in his eighth year he began to write and preach sermons in the habit of a Jesuit; and at twelve years of age the appearance of a comet again drew his attention to astronomy. His education was conducted among the Jesuits at Lyons; and being destined for the profession of the law, he was removed to Paris to prosecute the necessary studies; but having visited the observatory, every other pursuit was absorbed in his ardent passion for astronomy. Entering with redoubled vigour on his favourite studies, he soon endeared himself to his teachers by his zeal and progress in the sublime science which was the object of his labours.

When the academy of Sciences sent out Lacaille to the Cape of Good Hope to make observations for ascertaining the moon's distance from the earth, an opportunity offered of calling the practical knowledge of young Lalande into activity. He was nominated to conduct the requisite corresponding observations at Berlin; and the result of both was published in the Memoirs of the Academy for 1751, 1752, and 1753. In 1753 he was elected adjunct astronomer in the academy; and being afterwards admitted an associate, was appointed pensioner in 1772. In the year 1761 he succeeded his former master Delisle as professor of astronomy in the college of France; and, in a few years afterwards, appeared his treatise on Astronomy, which, in the improved third edition, published in 1792, in three volumes 4to, was justly regarded as the best and completest work on the subject. In 1765 and 1766 Lalande travelled in Italy, and the fruits of his observations on that country were published in eight volumes 12mo; and, at a later period of his life, he visited England, and was not a little gratified with the society of Maskelyne and Herschel, who were so deeply engaged in his favourite pursuits. During the last years of his life he published an Annual History of the Improvements and Discoveries in Astronomy. He died at Paris in 1807, when he had reached the 75th year of his age.

Beside numerous papers among the Memoirs of the French Academy, and the works already noticed, Lalande contributed the Treatises on Astronomy for the Encyclopedie Methodique and similar works; he compiled the *Connoissances des Temps*, and was the author of a Dissertation on Capillary Attraction, a Treatise on Canals, Astronomical Bibliography, and an Abridgment of the Theory and Practice of Navigation.

LAMA, the sovereign pontiff and prince of Thibet in Asia, who is regarded in some degree as an object of worship, or at least is held in great veneration. See THIBET.

LAMBERT, JOHN HENRY, an eminent German mathematician and natural philosopher, was descended from a family which the revocation of the edict of Nantes, and the consequent persecutions on account of religion, compelled to emigrate from France, and was born at Muhlhausen near the Rhine in 1728. Although he had given decided proofs of excellent talents in the early part of his education, the changed circumstances of the affairs of his parents interrupted the course of his studies, and required him to submit to the drudgery of his father's mechanical employment. But the sparks of his genius soon kindled into a flame, and burst through the dark cloud of adversity with which he was surrounded. To enable him to preserve the knowledge of classical literature which he had acquired at school, he purchased candles with the produce of his own little drawings, and thus devoted some of the hours of repose to his studies.

Having got into his possession a treatise on mathematics, he made himself acquainted with the principles of arithmetic and geometry, without the aid of a teacher. This fortuitous occurrence was probably the foundation of that predilection for mathematical pursuits for which his future life was so conspicuous. For some time he was engaged in writing in a public office, and was afterwards employed in the capacity of an amanuensis at Basle, where he had favourable opportunities of studying mathematics, belles lettres, and philosophy. For several years he superintended the education of the children of M. De Salis, the president of the Swiss Confederacy; and with the command of an excellent library, he failed not to improve himself in those branches of knowledge which had formerly occupied his attention, but also, by opening up new sources, to add greatly to his stock of information; and about the same time his mathematical acquirements were turned to advantage in the invention of machines for performing and facilitating scientific operations, among which are mentioned his machine for drawing in perspective, a mercurial chronometer, and arithmetical and logarithmic scales. While he travelled with his pupils in different parts of Germany, France, and Holland, the kindred pursuits in which he was engaged led him to form an acquaintance with the most eminent persons in science and literature in those countries; and, during his residence at Augsburg, he was admitted a member of the Bavarian academy of Sciences, with a pension.

The practical application of his geometrical knowledge was called into action when he was nominated one of the commissioners for settling the boundaries between the territories of the duchy of Milan and the Valteline; some years afterwards having the good fortune to attract the notice of Frederick the Great of Prussia, he was invited to Berlin, and admitted a member of the academy; and when the college for the improvement of the Prussian state was established, he was appointed chief counsellor of buildings,—an office which he held till the time of his death in the year 1777.

The studies of Lambert were directed to metaphysics, mathematics, and natural philosophy; and in all his investigations he discovers the man of genius and of original thinking. His *New Organon* is a comprehensive system of logic; in his treatise entitled *Architectonic*, he attempts to investigate those simple conceptions which are the foundation of all philosophical knowledge; and, beside the works now alluded to, his researches and writings extended to spherical trigonometry, practical geometry, optics, and astronomy.

LAMIUM, Dead-Nettle, a genus of plants belonging to the Didynamia class.

LAMP, a vessel or apparatus in which oil or some other inflammable liquid is burnt for the purpose of affording artificial light. The lamp was in general use among the ancient nations, and it is still employed among the inhabitants of uncivilized countries, where oil can be obtained from marine animals.

The simplest form of the lamp consists of a flat vessel for containing the oil and a few cotton threads, one extremity of which is supported above the surface of the liquid; when the cotton or other porous matter is lighted, the heat of the flame converts the oil which is absorbed into vapour; during the combustion of this vapour, light is given out; and as the oil is consumed, fresh portions are drawn up. The process by which light is evolved in lamps and candles is nearly the same. In the former the combustible matter is in a liquid state, and in the latter it is solid, but is first melted by the heat before its absorption by the wick, after which the remaining part of the process is the same.

In the production of artificial light, some gas containing carbonaceous matter is consumed. The carbone is in a state of very minute division, and, when the temperature is sufficiently high, it combines with the oyxgen of the atmosphere, and forms carbonic acid gas; but if the supply of oxygen or the temperature be deficient, the oxide of carbone is formed, and deposited in the state of charcoal. The nature of this process points out the conditions and properties for a perfect lamp, the first of which is the supply of carbonaceous matter and of oxygen; the second is the conversion of the carbonaceous matter into the gaseous state; and the third is, that the gas thus produced should be brought in contact with oxygen, at such a temperature as will enable the whole of the carbone to combine with oxygen, and produce the greatest degree of inflammation without smoke.

To obviate the inconveniences of the simple lamp, in which the oil is apt to be thrown out by the slightest motion, and the vessel itself intercepts a good deal of the light, various contrivances have been thought of and put in execution, most of which are either improvements of Argand's lamp, which was invented in France abont the year 1784, or proceed on the principle of its construction. In Argand's lamp, the wick is a hollow cylinder or tube of a coarse fabric of cotton, and the upper part of this wick, when lighted and supplied with oil, forms a circular flame. To furnish a copious supply of oxygen, a current of air passes through the inside as well as on the outside of the tube, and for the production of this current of air a cylindrical glass chimney is placed over the flame, and the rarified air within the chimney ascending, its place is supplied with fresh portions from below. In this lamp also an improvement is introduced by which the wick may be raised or lowered, and in this way the height of the flame is regulated.

In other lamps the oil is brought in contact with the wick by the pressure of air; in some by means of a column of water; and in others by the pressure of the upper part of the lamp itself, as in the statical lamp of Edelcrantz. For an account of the *safety lamp* used in coal-mines to avoid the risk of accidents by the combustion of the inflammable air,—see Coaliery.

LAMPYRIS, the Glow-Worm and Fire-Fly, a genus of insects belonging to the Coleoptera order. See Entomology.

LANARKSHIRE, a county of Scotland, so called from Lanark the county town, and Clydesdale from the river Clyde by which it is traversed, is bounded on the north by the counties of Dumbarton, Stirling, and Linlithgow; on the east by those of Edinburgh and Peebles; on the south by that of Dumfries; and on the west by those of Ayr and Renfrew; and is about 47 miles long, and 32 miles broad, containing 926 square miles, or 471,278 statute acres.

Mountains.—The southern districts of this county, destitute of trees and verdure, exhibit a bleak appearance; and even the ravines and vallies of the mountain streams, though far above the level of the sea, present nothing of the imposing grandeur which their elevation might indicate. The Lowthers form a lofty chain, part of which separates this county from that of Dumfries; another chain runs from the southern extremity northward along the border of Peebles-shire; and a third crosses the country, the western part of which is called the Hanghingshaw-hills, and the eastern part the Tinto-hills. Some parts of the Lowther ridge are upwards of 3000 feet above the level of the sea. The hill of Tinto is 2260 feet high. Coulter-fell is about the same height; and Cairntable is about 1650 feet.

Rivers and lakes.—The Clyde, which rises near the source of the Annan and the Tweed on the borders of Dumfries-shire, and flows in a westward direction to the Atlantic, is the principal river of the county. In its course, not far from the town of Lanark, it forms the celebrated falls of Bonniton, Corra-lin, and Stonebyres, is navigable to Glasgow, and in a commercial point of view may be regarded as the greatest river in Scotland. The other rivers of the county are all tributary streams of the Clyde; they are the Daer, the Coulter, the Methven, the Douglas, the Mouse, the Nethan, the Avon, North and South Calder, and the Kelvin, with others of less note. The lakes are not numerous or of great extent; they are, the Bishop's Loch between the parishes of Cadder and Old Monkland, the Black Loch in that of New Monkland, the Ged and Johnston Lochs, both in Cadder parish; Huggenfield and Frankfield Lochs, in the Barony parish; and the Hill-end reservoir, for supplying the Forth and Clyde canal. This latter sheet of water is in New Monkland parish, covers 317 acres, and has every appearance of a natural lake. This county can boast also of several mineral springs; as Walston, Monkland, Blantyre, and Rutherglen-bridge wells, some of which were formerly resorted to as watering-places. The Monkland canal, which connects Glasgow with the great coal fields to the east of that city, the Forth and Clyde canal, and the Ardrossan canal, intended to open a communication between Glasgow and the Atlantic, all either traverse the county, or are intimately connected with it, and may be regarded as in a great degree deriving their origin and support from it.

Climate and productions.—The climate of this county is distinguished from that of the eastern side of the kingdom by the greater quantity of rain which falls, owing to the clouds wafted from the Atlantic, and attracted by the hills over which they pass. As much of its surface is highly elevated above the level of the sea, the temperature is lower than in less exposed situations. The wind blows during a large proportion of the year from the south-west.

The minerals of this county are various, abundant, and valuable. The lower districts contain extensive quarries of excellent free-stone, as the magnificent streets of Glasgow can testify. Limestone is a common mineral in the neighbourhood of the Tinto hills, as well as in other districts. Iron-stone is found in many places in great abundance, and is smelted at the Clyde, Calder, Cleland, Shotts, and other furnaces in the county. Coal is still more abundant, is worked very extensively all around Glasgow, and in other places, and some of the veins are of great thickness. In the southern part of the county are very valuable lead mines, the property of the earl of Hopeton. The Susannah mine yields the richest ore; 18,000 bars, weighing nine stone each, are smelted annually; and silver is extracted from the lead in the proportion of from six to twelve ounces in the ton. Gold was discovered in this neighbourhood in the reign of James III. In the reign of James V. it was carefully sought for, and collected to the amount of L.100,000 Sterling; and, by consent of James VI. Queen Elizabeth was permitted to search for gold, in the rivulets of this district, for several summers.

Corn, grass, potatoes, and turnips, as in most other parts of Scotland, are the crops usually raised. About 2200 acres, chiefly on the banks of the Clyde and the other rivers, are covered with coppice-wood, which greatly improves the look of the country; and many thousand acres have been planted in the course of the last 50 years. Clydesdale has been long famous for its orchards. Nearly 400 acres are planted with fruit-trees between Hamilton and Lanark, and the profits resulting from them is, one year with another, extremely great. Half-an-acre has been known to yield fruit in one year to the value of L.150 Sterling. The draught horses of this county are justly held in high estimation, and have long caused the fairs of Lanark, Carnwath, Rutherglen, and Glasgow, to be much frequented by horse-dealers. The cows are of various breeds; and great numbers of sheep are reared in the higher districts.

Manufactures and commerce.—Glasgow, the centre of the trade, not only of Lanarkshire, but of Scotland, has been already described. Since the introduction of the cotton manufacture into that city, other arts have flourished, and commerce has been extended. The demand of Glasgow for coal and other minerals, has caused a great influx of wealth to the landed proprietors of the county; and the great abundance of useful minerals, of water, and favourable situations, have encouraged spirited men to embark great capitals in the erection of cotton-mills, and in carrying on the business of spinning and weaving cotton to an extent which speculation could never have anticipated. The mills at Lanark, at Blantyre, and in the vicinity of Glasgow, are on a great scale. The muslin made from the yarn thus produced, employs a great number of hands in almost all the towns and villages of the county; while printing, bleaching, calendering, and other operations relative to this manufacture, employ a great number more; and it is needless to add, that these again require the cultivation of many other arts, so as to render this one of the most populous and industrious counties in the kingdom. This extensive manufacture has been very favourable to the general improvement of the county; and hence it abounds with excellent roads and bridges, exhibits seats, villas, and even farm houses, built in an elegant, tasteful, and commodious manner.

Population.—In 1811, the number of souls in the Upper Ward were 28,868; in the Middle Ward 41,357, and in the Lower Ward 122,501, making a total of 192,726. But it cannot be doubted that this number is greatly augmented; for in the census made in 1821, the population of the Upper Ward had increased to 32,141.

Divisions and towns.—This county is subdivided into three districts called Wards. The Upper Ward, of which the burgh of Lanark is the chief town, contains the parishes of Lanark, Carluke, Carstairs, Carnwath, Dunsyre, Dolphington, Walston, Biggar, Libberton, Lamington, Coulter, Crawford, part of Moffat, Crawfordjohn, Douglas, Wiston and Roberton, Symington, Covington, Pettinain, Carmichael, and Lesmahagoe. The Middle Ward, of which the town of Hamilton is the centre, comprehends the parishes of Hamilton, Blantyre, Avondale, Kilbride, Stonehouse, Dalserf, Cambusnethan, Shotts, Dalziel, Bothwell, and Old and New Monkland. The Lower Ward contains Glasgow, the Barony parish, with those of Cadder, Cambuslang, Rutherglen, Carmunnock, Govan, and a part of Cathcart. These divisions are respectively placed under the particular jurisdiction of a substitute appointed by the sheriff-depute of the county.

Lanark, the county town, is a very ancient burgh, built on a slope of rising ground 290 feet above the level of the Clyde. The public buildings at present are, the town-house, a county-hall, a council-room, court-hall, and weigh-house, the prison, and the parochial church. Since the introduction of the cotton trade, the town has rapidly increased. The burgh contains about 3000 inhabitants, and the whole parish about 7000. Lanark is a place of interest both to the antiquary and the lover of picturesque beauty, for in the immediate vicinity are the celebrated falls of Clyde and many vestiges of ancient importance and memorable events. The first of the falls of Clyde is called Bonniton Lin, where the whole body of the river is precipitated over a rock of nearly 27 feet of perpendicular height; a mile below this is Corra Lin, upwards of 80 feet in height; two miles and a half below, is Stonebyres Lin, about 60 feet in height. The steep rocky banks between the falls are fringed with coppice-wood, and the whole scenery of the place is singularly grand and romantic. Not far from this burgh are the remains of two Roman camps, and the ruins of several monasteries, churches, and castles. It was the scene of Sir William Wallace's first military exploit, having in this town defeated and put to death William de Hesilrig, the English sheriff of Lanarkshire, who had murdered his wife. Kenneth II. held a parliament in it as early as the year 978; and it has the custody of the standard weight for Scotland. Attached to the grammar school is a library for the use of the inhabitants, bequeathed by Dr Smellie. It has seven annual fairs, is 30 miles west from Edinburgh, and 25 miles south-east from Glasgow.

New Lanark, a populous village about a mile to the south of the burgh, occupies a situation which was formerly a morass, and owes it origin to an extensive establishment for the manufacture of cotton-yarn, begun by the late Mr David Dale in 1784. A tunnel, a hundred yards in length, was mined through the rock to convey water to drive the machinery of the mills,—now four in number. They have from 20,000 to 30,000 spindles, and spin from 10 to 12 tons of cotton wool weekly. They employ men, women, and children to the number of nearly 2000, most of whom have their habitations in New Lanark. This village is well built, and the utmost attention is paid to the cleanliness, comfort, and moral and intellectual improvement of the inhabitants. It has a public washing-house and bleaching-green; two public schools, both taught gratis, are established; the one for those who can attend during the day, the other, an evening school, for those employed during the day at the works. The success which has attended these and other judicious as well as benevolent institutions at New Lanark, has made Mr Owen, the present manager, wish their extension to general society, by which he confidently anticipates that vice and misery shall be banished from mankind. But as the means proposed seem altogether inadequate to the end in view, and as the whole success of the scheme depends upon the extirpation of principles hitherto deemed essential to the constitution of human nature—however the benevolence by which it has been suggested deserves to be commended, it must be regarded as entirely impracticable, unless on a scale and in establishments similar to those in which it has been found advantageous.

Glasgow, the most populous city, not only of Lanarkshire, but of Scotland, has been already described in the order of the alphabet. The population in 1811, including the city and suburbs, amounted to 100,749; but, according to the census of 1821, it has risen to 146,000.

Rutherglen, erected into a royal burgh by David I. 1126, is situated about two miles and a half higher up the Clyde than Glasgow, is now but a mean place of a single street, with some lanes. It has several fairs for horses, and a population of 1630 individuals.

Hamilton, pleasantly situated on the Clyde, about 12 miles above Glasgow, was erected into a burgh of barony in 1456, a royal burgh in 1548, but resigned its privileges after the restoration, and was in 1670 made a burgh of regality. The duke of Hamilton has a seat near this town, noted for a gallery of fine paintings. In the town are a handsome church, a town-house, prison, and commodious markets. The hospital endowed by the Hamilton family receives eight old men, and allows them a house, coals, and L.5 annually; Robertson's hospital allows L.4 to each of nine old men yearly; and Aikman's accommodates four old men, and affords an annual pension of L.5 to each, with a suit of clothes every two years. The women of Hamilton have been long famous for spinning fine linen yarn, and thread lace was formerly manufactured; but the cotton weaving is now the staple trade of the place. It contains between six and seven thousand inhabitants. Dr Cullen, the celebrated physician, and Mr Millar, professor of law in Glasgow college, were natives of Hamilton. Three miles below this town on the Clyde, and on the road to Glasgow, is Bothwell-bridge, where the covenanters were defeated by the loyalists under the duke of Monmouth, on the 22d of June 1679. Bothwell church was founded by Archibald, the Grim, earl of Douglas, for a provost and eight prebendaries, in 1398. Bothwell castle is an oblong square, the walls of which are upwards of 15 feet thick, and in some places 60 feet high.

Carnwath, a considerable village on the road between Edinburgh and Lanark, consists chiefly of one street, nearly half a mile in length. Its church was founded by Sir Thomas Somerville of Carnwath, for a provost and six prebendaries, in 1424. The village is 25 miles from Edinburgh, is surrounded with good pastures and some cultivated land, and has two annual fairs.

Leadhills, a mining village, 46 miles south-west of Edinburgh, with 1000 inhabitants, employed by two mining companies who farm the hills containing the lead ore from the earl of Hopeton, the proprietor, who receives from the company every sixth bar of lead as his rent. The surrounding country has a most bleak and sterile appearance; but, by means of culture, a few spots yield corn, potatoes, and culinary vegetables. The miners are a sober intelligent class of men, and have established a library for the instruction and amusement of their leisure hours.

Biggar, a small town on the borders of Peeblesshire, and 27 miles from Edinburgh, contains about 500 inhabitants, employed in weaving, or in driving lead from leadhills. The church was founded by the third Lord Fleming in 1545, when Lord High Chamberlain of Scotland. To the west of the town is a beautiful green hill, 600 feet above the level of the Clyde, on which Wallace is said to have held a conference with his followers before the battle of Biggar. In a morass near the town are the ruins of a strong fortification, or camp, of a circular form, comprehending more than an acre of ground, and surrounded by a double wall of earth.

Douglas, on the brook of that name, and on the great road between Glasgow and Carlisle, is a considerable village, containing a population of nearly 2000 souls, many of whom are employed at the cotton mills in the vicinity. The old castle of Douglas, which was burnt down many years ago, has been in part rebuilt, and forms one of Lord Douglas's seats.

Strathaven, on the river Avon, contains 1610 inhabitants, chiefly employed in the manufacture of cotton, and is about seven miles from Hamilton.

Airdrie, 11 miles east from Glasgow, is finely situated between two rivulets, with wide and regularly built streets. Its inhabitants are nearly 2000 in number; a considerable quantity of malt spirits are distilled in it, but the weaving of cotton is the staple trade.

LANCASHIRE, a maritime county of England, bounded on the north by Cumberland and Westmoreland, on the east by Yorkshire, on the south by Cheshire, and on the west by the Irish sea, is divided by the indentations of the coast into three large peninsulas, and exhibits in other places a very irregular outline. The most northerly of these divisions is formed by the estuary of the river Dudden on the border of Cumberland, and by the bay of Morecambe and the mouth of the river Ken. This peninsula bears the name of Furness, and is wholly detached from the rest of the county by the intervention of a part of Westmoreland. The intermediate peninsula lies between the northern border of Furness and the river Kibble, and is known by the name of Amounderness or Anderness, and that to the south is situated between the Kibble and the Mersey.

Extent and aspect.—Furness, the detached portion, has a wild and rugged surface; the whole district consists of an irregular and romantic mixture of craggy hills, narrow vales, lakes, rivers, and brooks; and the northern part towards Cumberland is mountainous, and is hence called High Furness; while that portion bounded by the Ken and Morecambe bay, being flatter, bears the name of Lower Furness, is a fertile tract, and is fronted by the bow-like isle of Walney. This division of the county is about 28 miles long, and upwards of 14 miles broad. The second peninsula, which extends from the Ken to the Kibble, is fully 30 miles from south to north, and 18 miles from east to west, and is generally flat, except on the borders of Yorkshire. The third peninsula, formed hy the Kibble on the north and the Mersey on the south, is about 45 miles long from east to west, and 25 miles broad from south to north. The surface towards the east is greatly diversified with hills and dales; but is nearly level towards the west. The whole county is 75 miles long, 45 miles broad, and containing 1800 square miles, or 1200,000 statute acres.

Mountains.—Of the mountains of Furness, Coniston-fell rises 2577 feet above the level of the sea; as also Wittle-hill, which is 1614 feet above the same level. The whole extent of the eastern border is hilly; and Pendle-hill, near Clitheroe, is 1803 feet high.

Rivers.—Few of the counties of England are so well watered as Lancashire. Numerous rivulets and brooks take their rise in the hilly country by which it is bordered on the north and east. And thus, though the mouths of the rivers which break the coast are not particularly numerous, yet the interior is characterized by narrow vallies, with their respective streams. The Mersey, which flows between this county and Cheshire for nearly 60 miles, has its source in Derbyshire, and is considerably augmented by tributary streams from the Lancashire side. The principal of these is the Irwell, which rises in the elevated country near Burnley, and being joined by numerous brooks, forms a respectable stream as it flows through the manor of Tottington, and passes the town of Bury: Below this place it forms a junction with the Roch, and then bending westward meets a rivulet from Bolton, when it flows in a south-east direction towards Manchester, where it receives the Matlock and the Irk; thence flowing in a westward course, it runs through Barton, when it passes under a stupenduous aquæduct of the duke of Bridgewater's canal, and thence falls into the Mersey below Flixton. The banks of the Irwell are often bold and picturesque, and almost crowded with cotton manufactories and villages. The Alt rises near Knowlsley, the seat of the earl of Derby, and flows in a north-west direction to the Irish sea, which it joins to the south of Formley point. The Kibble, one of the largest rivers in the north of England, has its source in the moors of Craven in Yorkshire; and in its course through a well cultivated country is increased by many small streams as it flows through the romantic valley of Ribblesdale, and by the Douglas, Lostock, and Yarrow, below the town of Preston. It falls into the Irish sea by a broad and navigable estuary. The Wyer rises in the heights in the north-east division of the county, and after being increased by the Calder, and other streams, expands into a spacious bason called Wyer-water, and again contracting its banks, joins the Irish sea by a narrow channel. The next considerable river to the north is the Loyne or the Lune, which waters the beautiful valley of Lonsdale, and which is navigable for vessels of considerable burden two miles above the city of Lancaster. In the Furness district are the Crake, the Leven, and the Dudden.

Lakes.—The celebrated Windermere is partly in this county and partly in that of Westmoreland. It is 15 miles in length, and, at an average, about one mile in breadth; has, in many places, very steep banks; receives a number of streams from the neighbouring fells, and discharges its waters by the river Leven, in the course of which are several cascades. This lake abounds with char and other delicate fish; its banks exhibit fine scenery, and some parts of its surface is studded with islands, ornamented with turretted buildings. Coniston lake, or Thurston water, is about seven miles long, and three quarters of a mile in breadth. The shores are indented by several small bays, and the surrounding scenery consists of coppice woods, small farms, and patches of rocky common, rising from the shore, above which the mountains reach a considerable elevation. At the north-east end is the village of Coniston, behind which rise the romantic mountains called Coniston-fells. This lake also abounds with char. Esthwaite lake is about two miles long, and half a mile broad, and is fringed with trees and coppice woods. It is almost divided by two peninsulas, which, opposite to each other, project from either shore. Near the head of the lake is an isle which formerly floated, but has now become stationary. Perch, pike, and eels are found in it, but no char, though its waters unite with those of the Windermere.

Sea-coast.—The mouth of the Mersey, about two miles below Liverpool, is crossed by a bar of sand, so as to prevent ships of burden from entering or clearing the estuary except at high water. The tides rise from 20 to 28 feet. The estuary of the Kibble is incommoded with sand banks at ebb-tide, but when full the water is six fathoms deep on the highest of them. Morecambe bay is a large gulph between the district of Furness and the more southern division of the county. To the north of it are several flat islands, the largest of which is that of Walney. At the head of this bay are the Leven sands; and at the mouth of the Lune are those of Lancaster. They are fordable at low water, but dangerous as a route, as the tide rises over them to a great depth. The whole extent of the shore between these estuaries and inlets is extremely flat, and is in some places encroached upon by the sea.

Canals.—In Lancashire the system of inland navigation, by which the Mersey has been united with the Humber, and the Severn with the Thames, had its origin. The Sankey canal, which begins at the coal and copper works near Prescot, and which is nearly 12 miles in length, was the first cut of this kind in the kingdom. The Ashton-under-line canal, which forms a communication between Manchester and Ashton, commences at the east side of Manchester, and at Ashton passes through a long tunnel, and then joins the Peak-forest canal. A branch goes off from Fairfield to Oldham; the whole length is 11 miles, and the rise 150 feet. The duke of Bridgewater's canal begins in the suburbs of Manchester, and terminates near Leigh. It is carried through a tunnel to an extensive colliery, has branches communicating with the Irwell and Mersey navigation, and with the Bury and Bolton canal. Under the town of Manchester are arched tunnels for a portion of this canal, from one of which coals are raised through a shaft by machinery. The canals now mentioned unite with each other, and form an uninterrupted line of communication throughout England.

Climate and soil.—The general characteristic of the climate of this county, as distinguished from other parts of England, is excessive humidity. The mountains on the north and east parts of it attract and break the clouds from the Irish sea, a circumstance which produces a great deal of rain. The soil is very various, frequently changing its qualities at extremely short distances. A great proportion of the cultivated land is a strong clayey soil, resembling what is called *carse* land in Scotland.

Productions.—Lancashire abounds with coal and limestone, and it contains also excellent quarries of sand-stone, well fitted for architectural purposes; and as some of it is of a slaty structure, it splits easily into thin broad tables, and is used for floors, roofs, dyers vats, grave-stones, and even for fences set on edge. At Hawkshead are quarries of blue roof-slate; scythe stones are found at Rainsford; iron ore abounds in Furness, and lead is obtained from a mine near Chorley. Coppice-wood, grass, corn, potatoes, and culinary vegetables may be stated as the common productions of the soil. The long-horned cattle of this county are well known by the name of the Lancashire breed. In some districts great quantities of poultry are reared; and flocks of geese are brought from distant places to Martin-mere on a certain day, to be fattened for the market; and the owner of the mere claims the half of the stock as his share of the profit. Salmon is found in some of the rivers; char, as has been already noticed, abounds in the lakes; and trout are natives of most of the streams.

Agriculture.—Till of late years the improvements of agriculture had not been carried to great perfection. A considerable extent of moors, mosses, and commons is still in a state of nature. The multitude of horses kept, for the conveyance of goods to and from the manufactories, requiring a great deal of hay, causes a large proportion of the arable land to be kept constantly under grass. The natural grasses of the soil are preferred, and hence all the culture that the meadows undergo is drainage when necessary, irrigation when practicable, and a top-dressing with stable manure, immediately after the hay has been carried off, once every three or four years, with one of lime at longer intervals. Tillage is never resorted to, and many meadows in the county have not been broken by the plough in the memory of man. Oats, wheat, and potatoes, and of late years turnips and tares, are cultivated to a considerable extent. Oats may be regarded as the staple crop, and are often sown many years together successively on the same field. The plough in general use is a clumsy imperfect instrument, drawn sometimes by five horses, and seldom by fewer than three. The soil of the county is well adapted for potatoes, and they are raised early in the season, in great abundance, and of excellent quality. The county is celebrated in like manner for gooseberries, and great care is bestowed on their culture. The copse fences, which prevail throughout the county, are great nuisances, as they waste the land and harbour vermin. They are formed of a thick embankment of earth, surmounted with straggling shrubs. Agricultural improvements have been lately carried into Lancashire; and it is now no unusal thing to see Wilkie's iron plough, drawn by a couple of horses abreast.

Manufactures and commerce.—Woollen goods, such as flannels and blankets, formed the most extensive manufacture of this county before the introduction of that of cotton, which has been long the staple. A great deal of woollen goods are still manufactured, especially in Rochdale and Bury; but the cotton trade has spread over the greater part of the county, and even penetrated far into Cheshire. Manchester is the centre of this trade, and every town and village, and indeed almost every house in the county, is more or less connected with it. The smelting of iron and copper, the making of glass, paper, lamp-black, vitriolic acid, of watches, hats, stockings, pins, and many other articles, also constitute important branches of industry. Liverpool and Lancaster are the principal commercial towns. The former has a most extensive trade with the West Indies, America, the East Indies, Africa, and the south of Europe. The trade of Lancaster is of the same description, but greatly more limited. The inland trade is also extensive; it is carried on by means of the canals, and is subservient to the cotton and the other manufactories.

Population.—The inhabitants of this county have increased much more rapidly than the other districts of the country not stimulated by the introduction and the extension of manufactures and trade. In 1700, the population was only 166,200 individuals; in 1750 it was 297,400; in 1801 it had increased to 695,100; in 1811 it had augmented to 828,309.

History and divisions.—At the time of the Roman conquest, this part of Britain was inhabited by the Brigantes; or, according to Ptolemy, by the Sistuntii. The Romans first entered it under Julius Agricola, 79 years after the Christian era. They formed several stations in it, of which Mancunium or Manchester was the principal, and made excellent roads. They also included it with Yorkshire, under the name of Britannia Superior. After it was taken possession of by the Saxons, it formed a part of the kingdom of Northumbria. About the year 680, after it had been conquered by Egfrid, it was formed into a separate county, and divided into hundreds and tithings. John of Gaunt obtained for it the dignity of a county-palatine, which it still retains. At present it is divided into six hundreds, namely Salford, West Derby, Leyland, Blackburn, Amounderness or Anderness, and Lonsdale. It returns 14 members to parliament, and is in the province of York, and in the dioceses of Chester and Carlisle.

Towns.—Lancaster, in Lonsdale hundred, the county town, is finely situated on a rising ground, the summit of which is occupied by the castle and the church. The river Lune flows on the north side of the town, and is crossed by a magnificent bridge. Many of the streets are narrow, but the houses are generally good, and constructed of free stone, and covered with slate from the neighbouring quarries. The castle is supposed to have been first built by the Romans; it is believed that the large square keep was the work of the Saxons; but the main building was erected by Edward III. and his son John of Gaunt, the first duke of Lancaster. It includes within its walls a spacious area. The whole is now used as the county prison, and is one of the most complete establishments of the kind in the kingdom. The summit commands an extensive and highly diversified view, including the windings of the Lune, Morecambe bay, and the mountains of Cumberland, Westmoreland, and Yorkshire. The parish church, a spacious gothic structure, stands near the castle. Besides two chapels of ease, the Quakers, the Presbyterians, the Roman catholics, the Independents, and the Methodists have their respective places of worship. The town hall, the custom-house, the assembly-rooms, the theatre, and the free school, may be enumerated among the public buildings. About a mile east from the town, the Lancaster canal is carried across the Lune by means of a magnificent aquæduct, erected at the expence of L.45,000 Sterling. The town possesses also a large quay with many warehouses, and carries on a considerable commerce with America and the West Indies in hard ware and woollen manufactures. Ship-building and sail-cloth manufactures are extensive branches of industry, as well as the spinning of twine and the printing of cotton. The population in 1811 was 9,247.

Liverpool, in West Derby hundred, is situated near the mouth of the estuary of the Mersey, and, next to London, is the largest sea-port in the British dominions. The Mersey, which is about two miles broad, affords excellent anchorage to any number of the largest vessels; but the entrance is rendered difficult by means of a bar. The town extends about three miles along the east bank of the river, and more than one mile inland. The docks, with the wharfs and warehouses, which form a stupendous range along the river side, give a stranger a deep impression of the vast commerce of the place. On the inland side the town stretches to the township of Kirkdale on the north, to those of West Derby and Everton on the east, and to the skirts of Toxteth-park on the south; and is prolonged into numerous and extensive suburbs, consisting of elegant villas and country houses.

Streets and public buildings.—The streets are well paved, in general spacious and airy, and many of them elegant; the houses are built of brick, and covered with slate from North Wales. The public buildings, which are numerous and splendid, are the Town-hall, the Exchange, the Lyceum, the Athenæum, Wellington-rooms, infirmary, workhouse, Blue-coat school, dispensary, asylum for the blind, theatre, circus, and concert-rooms. The established churches are at present 20 in number; and the different denominations of dissenters have chapels. Many of these edifices, especially the Exchange-buildings, exhibit much architectural beauty and a great deal of costly and tasteful ornament. To these may be added the tobacco-warehouse, the panorama, the museum, and the botanic garden.

Charitable institutions.—The benevolent establishments of the town are numerous, well supported, and adapted to almost every species of distress. About 1500 patients are admitted annually into the infirmary; and many out-patients receive medicines and advice. The dispensary was established in 1778, for the purpose of distributing medicines to the poor; and now it relieves to the amount of 20,000 patients. The Blue-coat school was erected in 1710, and in it 200 boys and girls, chiefly orphans, are now educated. The asylum for the blind is on the most extensive scale, as it admits blind persons from all parts of the kingdom; it is also the parent of similar institutions. The blind are employed in making ropes, baskets, carpets, list shoes, and a variety of other articles. These establishments are supported chiefly by voluntary subscription; and, besides them, there is an hospital for decayed sailors and their widows and children, supported by sixpence a month from each seaman's wages; a fever hospital, for preventing the spread of infection; the Ladies' charity, for the relief of poor married women; a penitentiary; the Stranger's Friend society; the Welsh benevolent society; St Patrick society; the Female school of industry; and a society for the relief of small debtors.

Literary establishments.—The Royal Liverpool Institution was opened in 1817, and was founded for giving a liberal education to the sons of the wealthy, and for diffusing a taste for literary and scientific pursuits. Public lectures are delivered. The Literary and Philosophical Society of Liverpool meet to read their papers, and to discuss subjects connected with the object of their association; and the artists of Liverpool have an annual exhibition of their productions in painting and sculpture. The botanic garden was formed in 1801, at an expense of L.10,000, and, for the number and value of its plants, as well as for the manner in which it is kept, it ranks among the first in the kingdom. The Lyceum, the Athenæum, and the Union News-room, are elegant buildings erected for the purpose of reading rooms and libraries. The library of the Lyceum contains more than 10,000 volumes, which are allowed to circulate among the proprietors.

Commerce, &c.—The Town-hall cost L.100,000 Sterling; it was partly destroyed by fire in 1796, and has since been repaired at an expense of L.60,000. Connected with this are the Exchange-buildings, erected in 1803, at an expence of more than L.100,000 Sterling. In the area in front of these magnificent buildings is a groupe of bronze statuary commemorative of the death of Lord Nelson. In the east wing is a news-room 94 feet long and 52 feet broad; and the whole taken together exhibits a very fine specimen of Grecian architecture. The Custom-house, though well contrived, is now too small for the extended business. The Corn-exchange cost L.10,000 Sterling, and the borough jail is a spacious edifice on Howard's plan. The male prisoners are kept at work, and the women are instructed in useful knowledge by a committee of ladies of the society of Friends. Another jail was erected in 1819, at Kirkdale near the town, for the hundred of West Derby.

Liverpool may be regarded as entirely a commercial town, to which every other pursuit and branch of business are subservient. Its imports from Ireland consist of grain, provisions, live-stock, and many other articles; for which salt, coals, and manufactured goods are exported in return. The cargoes in the course of a year amount to between 2000 and 3000. Its commerce with the United States is very extensive, consisting of more than three-fourths of the whole commerce of this kingdom with North America. The importation of cotton-wool forms the staple article of this branch of foreign trade; and vast quantities of cotton, woollen, and other manufactured goods are thence exported to the States. In the year 1818 Liverpool imported 423,120 bales of cotton-wool from the States; while London in the same year imported only 186,700 bales, and Glasgow 48,880 bales. The trade of this town with the West Indies is also extensive, and is rapidly increasing with other parts of the globe. Since the opening of the out-ports to the East India trade, a new source has been opened to commercial enterprise. In the year 1814, one vessel of 512 tons was cleared out for India. Since that period, the number of vessels sent to the same quarter, and of course the tonnage, have been rapidly increasing; so that in the year 1818 no fewer than 33 vessels cleared out for India, the aggregate burden of which amounted to 14,100 tons.

The docks, for mooring and repairing ships required for this immense trade, are numerous and extensive. The dock dues in 1819 exceeded L.110,000. This source of wealth is public property, and is managed by trustees appointed by the corporation, who have the charge of keeping the docks and quays in repair, and of improving and extending them. The conveyance of goods to Liverpool for exportation, and the transmission of such as are imported into it, are facilitated by means of the Mersey and Irwell navigation, and by the numerous canals which intersect the country.

Manufactures.—Iron and brass founderies, sugar-houses, soap-works, breweries, ship-building, roperies, and other branches of industry connected with shipping or the consumption of the inhabitants, constitute the manufactures of the place. A great deal of flour is ground at the numerous windmills in the vicinity, as well as by a tide-mill, and another driven by steam. Watch-movements, tools, mathematical instruments, and china, are also manufactured to a considerable extent.

Population and history.—In 1700 the inhabitants of this town amounted only to 5000, but in 1801 they had increased to 77,653; in 1811 they were 94,376, or, including 7000 sailors, and the inhabitants of Toxteth-park and some other villages, 120,000; and now, in 1821, they amount to 141,487. It appears from this statement, that Liverpool has risen with an astonishing rapidity in commerce, wealth, and population. In the beginning of the 16th century, Leland describes it as a paved town, having only a chapel, the parish church being Walton, four miles distant from the sea. In 1565 it contained but 138 inhabitants and 223 tons of shipping; and in a petition to queen Elizabeth, the inhabitants style it "Her Majesty's poor decayed town." In 1699 it was freed from its parochial dependence on Walton, and empowered to build a new church. In 1709 a small vessel is mentioned as having sailed for Africa. Since that time it has been constantly improving, till at last it has reached its present greatness. It sends two members to Parliament; and is 203 miles from London, and 36 miles from Manchester.

Manchester is situated on the east bank of the river Irwell, where it is joined by the smaller streams of the Irk and the Medlock. Salford, on the west bank of the Irwell, though under a different jurisdiction, is yet so closely connected with Manchester as to form part of it, and is therefore always comprehended in any general description. A communication is opened between them by means of three stone bridges.

Streets and public buildings.—The ground on which Manchester stands is nearly a dead level; and, from whatever side it is approached, a crowded assemblage of spires, towers, manufactories, and warehouses is seen mingled with the cloud of smoke which usually hovers over it. The houses are generally constructed of brick made in the immediate vicinity, and covered with blue slate from Wales. The streets are well paved; most of the foot-paths are laid with flag-stones; and many of the streets are lighted with gas. Great additions to the town, especially towards the east, are projected; and Portland Place, Mosely-street, Ardwick-green, a suburb on the London road, and Salford crescent, which looks over the romantic vale of the Irwell, would be regarded as fine ranges of buildings in any town. The public buildings and charitable institutions correspond to the magnitude and wealth of the place. The churches are sixteen in number; and of these the Collegiate church is built in the cathedral style, and has a warden, four fellows, and two curates. The dissenting chapels are more numerous than the churches, and some of them are large and neatly fitted up. Cheetham's hospital maintains and educates 80 boys, and afterwards apprentices them to whatever trade each of them may choose. The Institution has a library of about 20 thousand volumes, and a valuable museum attached to it. Every inhabitant of the town has a right to read in the library, but the books are not lent out. The grammar school is well endowed, and has exhibitions at Oxford. The infirmary includes an hospital, a dispensary, and a lunatic asylum. Among the other charitable institutions are a lying-in-hospital; the Ladies society for a similar purpose; the House of recovery, or Fever-ward; the Stranger's Friend society; the Poor-house; and others of a similar nature. The schools are numerous; one of them is erected on Lancaster's plan, and educates upwards of a 1000 children; two are established on Dr Bell's system, beside many others. The Manchester Philosophical and Literary society was founded in 1781, and has published several volumes of Transactions, in which are many valuable memoirs. The Exchange is an elegant building, in the Doric style. The portico is in the Ionic style, and was built in 1803 for a news-room and library: it is frequented chiefly by professional men. The New-Bailey prison is in Salford, and is large, secure, and commodious. The markets are conveniently situated, and abundantly supplied both with the necessaries and the luxuries of life. Water is brought into the town from an extensive reservoir, and distributed through it in large stone pipes. The assembly-room in Mosely street, the theatre, the concert-hall, and the other public buildings of the town, are all on a scale suited to the accommodation of a great and wealthy population.

Manufactures.—This town owes its greatness to the skill and enterprize with which its various manufactures have been conducted. Coarse woollen fabrics, with tapes, laces, saddle-girths, and other small wares, formed the original manufactures; but since the introduction of the cotton trade, every other branch of industry, though carried on more extensively, has been thrown into the shade. Some idea of the vast extent in which cotton wool is spun and formed into velvets, fustians, dimities, calicoes, checks, ticking, jeans, shirtings, ginghams, quiltings, handkerchiefs, nankeen, diapers, muslinets, handkerchiefs, muslins, cambrics, and other fabrics, may be learned from the fact, that of about 132 millions of pounds of cotton wool, which in 1817 was imported into Great Britain, besides 32 millions of pounds which at that time remained in the ports or in the warehouses of dealers, 96 millions of pounds were used in England, and of course chiefly in Manchester and its neighbourhood. The process of carding, spinning, and, in many instances of weaving, is performed by means of machinery. Some of the operations of bleaching, and of calico-printing, are also carried on by machinery; and a dye-house is constructed with a row of wash-wheels driven by water on the one side, and with a row of vats made of flag-stone, heated, and the goods in them turned by steam, on the other. Iron and brass founderies are numerous, as well as chemical works, and a vast variety of other branches of industry, either connected with the cotton manufacture, or for the comfort and accommodation of the population which it employs and enriches. The hat manufacture is also extensive; and paper is made in great quantities, and in great perfection. The situation of Manchester, in an extensive coal-field, and amid streams of considerable descent, together with new and ingenious applications of the mechanical powers, as well as enterprise being unchecked or opposed by the barrier of chartered rights, has contributed to raise it to the pre-eminence which it holds as a manufacturing town; and, as it forms a common centre of the cotton-manufacturing district, the spinners, manufacturers, printers, bleachers, &c. deposit their finished goods in it, and have thereby caused it to become the cotton warehouse of the world. The roads, which diverge from the town in every direction, are kept in good repair; and by means of them, and still more by means of canal and river navigation, a communication is opened between it and every part of the kingdom.

Population, &c.—The chief magistrate is called Boroughreeve, who, with two constables, a deputy constable, and a number of inferior officers, regulates its municipal affairs. The quarter-sessions is held in the court-house of the New Bailey prison, Salford. A magistrate, with an annual salary, sits in the same place daily, to dispose of summary cases; besides which, a court of requests, a court for the recovery of small debts, a baronial court in Manchester, and a hundred court in Salford, are established. The growth of this town in manufactures, and consequently in size, wealth, and population, has been astonishingly great. In 1757, the inhabitants amounted to 19,600; sixteen years afterwards, they had increased to nearly 43,000; in 1801, they were 84,000; in 1811, they had risen to 98,000; and in 1821, the number exceeded 150,000. The distance from London is 182 miles.

Warrington, situated in West Derby hundred, on the north bank of the Mersey, over which is a stone bridge, consists of narrow streets, in which old and new, good and bad houses, are blended together. The parish church is an ancient building, containing numerous monuments. Sail-cloth is the staple manufacture, besides which, pin-making, glass-making, iron-founding, and mat-making, are also carried on. Vessels of 80 tons burden can reach the Bank quay at high water; and at that place, a short way below the town, are warehouses, cranes, and other conveniences. The number of inhabitants in 1801 exceeded 10,000. Warrington is on the road between Liverpool and Manchester, about 18 miles from each of these towns.

Winwick, in West Derby hundred, was the favourite residence of Oswald, king of Northumberland, and is one of the richest rectories in England, being now, it is said, worth L.9000.

Wigan, in West Derby hundred, is a well built town, on the river Douglas, with a handsome church, and other public buildings. The manufactures are, cotton goods of different kinds, iron furnaces and forges, brass and pewter works. The charities are, a free school, blue-coat school, workhouse, and dispensary. The population in 1801, amounted to 11,000. Wigan was the birth place of Leland, the theological writer.

Blackburn, Bolton, Bury, and Chorley, have been already described in the order of the alphabet. Clitheroe, at the foot of the Pendle-hill, on the Ribble, though a small market town, sends two members to Parliament.

Ormskirk, in West Derby hundred, consists of four streets, with a church remarkable for having the steeple and tower detached. The number of inhabitants is about 3000, supported by the cotton trade.

Prescot, in West Derby hundred, is a well built town, the church of which is large, with a lofty steeple. Plate glass, watch movements, and various branches of the cotton trade, form the principal employment of the inhabitants, who are about 5000 in number.

Preston, in Amounderness hundred, on the Ribble, is a pleasantly situated town, the inhabitants of which, about 15,000 in number, are employed chiefly in the cotton trade. The streets are broad, and the houses are well built. The church, the town-hall, the assembly-rooms, and other public buildings, contribute to ornament the town. Preston is the seat of several law courts; and the schools and other charities are suited to the extent and importance of the place. By the charter of the town, first granted by Henry II., and confirmed by succeeding princes, the inhabitants are obliged, at the end of every 20 years, to hold a kind of jubilee. The last Guild, as it is called, commenced on the 30th August 1802, when processions of persons at the head of the different manufactures, with emblematic devices, took place, and presented a very imposing shew.

Rochdale, in Salford hundred, takes its name from the river Roche, on which it is built. It is noted for its extensive woollen manufactures, and contains about 12,000 inhabitants.

Haslington, is a small ill built town, in which a good deal of cotton is manufactured. A colony of Scotch pedlars have established themselves at this place, and find a livelihood by retailing articles of dress, tea, and other goods, through the surrounding country and villages.

LANCASTER, Joseph,—for his mode of teaching, see Schools.

LANCE, a species of fish; also a long spear, in the form of a half pike, used by ancient cavaliers, particularly by the Saxons and Normans. It was also used by the Greeks; and something of the kind has occasionally been adopted in modern times. As an offensive weapon it was particularly employed by the cavalry, who, in charging, rested the butt-end against the bow of their saddle; and it was also sometimes used as a weapon of defence by infantry and dismounted knights. In tilting, this weapon was blunted in the head, by which means it was hindered from penetrating an opponent. But, notwithstanding this, the force with which it was impelled not unfrequently proved fatal.

LANCET, a small sharp-pointed instrument, used in bleeding, and for opening tumours. The term is also applied to a particular form of Gothic arch.

LANCH, or Launch, a long boat of a particular construction, which, being more flat in the bottom than the long boat, is better adapted for approaching a low shore.

The term is also used to denote the movement of a ship when she descends from the scaffolding on which it was built into the water, and when, all the blocks and wedges, by which she was supported, being driven from under her keel, her weight gradually subsides, and she gently slides along ways prolonged so far as to enable her to reach her natural element. On this occasion, various ceremonies are usually performed, more especially in the case of ships of war, when many thousand spectators have sometimes been known to attend. The operation of launching is not always free from danger; and there are several examples on record of serious mischief accompanying it.

Mr Samuel Morton, Leith Walk, Edinburgh, recently proposed and obtained a patent for a very ingenious and safe method of effecting the launching of vessels. See the annexed Plate and its explanation.

LAND, denotes earth, as distinct from water, and in agriculture it signifies arable ground. It is variously denominated according to the nature of the soil,—for which, see Agriculture.

LAND-WAITER, a customhouse-officer, appointed by government to examine every kind of imported merchandise, of which it is his duty to keep an exact account.

LANDAFF, a city of South Wales in Glamorganshire, seated upon a rising ground on the river Taff, near Cardiff. It has a cathedral church, said to have been founded soon after the introduction of Christianity into Britain in 186, and is an episcopal see.

LANDAU, a handsome town in the department of the Lower Rhine in France, on the river Zurich. A particular kind of four wheeled vehicle is thus denominated, as the term landaulet is applied to another description of carriage.

LANCEROTA, one of the Canary islands, is about 26 miles in length, and produces grain and cattle. See Canary Islands.

LANDEN, John, a celebrated English mathematician, was a native of Northamptonshire, and was born in 1719. He became an early proficient in mathematics, and began his contributions to the Lady's Diary in 1744, which he continued at times till within a few years of his death. Few events, excepting what are connected with the progress of his works, and his profound investigations, mark the life of Mr Landen. Previously to the year 1762, he had lived as a farmer near Peterborough; but at that time he was engaged by Lord Fitzwilliam to undertake the office of land-steward, and in that situation he continued till within two years of his death.

In 1754, a memoir by Mr Landen, containing an investigation of some theorems which suggest several very remarkable properties of the circle, &c. appeared in the Philosophical Transactions; and in the succeeding year he published "Mathematical Lucubrations,"—a title selected to indicate that mathematical pursuits occupied his leisure hours only. In 1758 he published, by subscription, "The Residual Analysis, a new branch of the Algebraic Art;" and he continued the investigation of the same subject in the Philosophical Transactions, or in separate treatises. Mr Landen entered deeply into the discussion of the subject of rotatory motion; and, in the second volume of his Memoirs, he gives a solution of the general problem concerning rotatory motion, and an investigation of the motion of the equinoxes, in which he points out the cause of Sir Isaac Newton's mistake in his solution of that celebrated problem. This work was finished, and a copy of it put into his hands the day before he died, in 1790, when he had reached the 71st year of his age. For a full account of the profound mathematical investigations in which Mr Landen was engaged, the reader may consult Aikin's *General Biography*. But it is to be regretted, that a mathematician of such distinguished celebrity should have indulged in a style of acrimony, or should have treated those with whom he differed with asperity of language.

LANDES, a department in the south-west of France, is bounded on the north and east by the departments of Gironde, Lot and Garonne, and Gers, and on the south and west by the Lower Pyrenees and the sea. It covers a surface of 480 square leagues, and is watered by the rivers Adour and Medan. Great part of the surface is sandy and unfruitful, or covered with heath and marshes; but in the south-east the soil is better, and produces grain and fruits. Cork, charcoal, and resin, are also enumerated among the productions of the department. Many of the inhabitants are employed in the rearing of sheep. The population is stated at 229,000; and the principal towns are, *Mont de Marsan*, which is the capital, and contains about 3000 inhabitants; *St Sever*, with 6000 inhabitants; and *Dax*, with more than 4000 inhabitants.

LANDGRAVE, (land, a country, Gothic, and Grafforgrave, a count, German,) a German title of dominion, given originally to those who dispensed the law for the emperor. These judges assumed authority over several districts in which they presided, and in time the title became hereditary. It is now conferred on poor princes of the empire, who possess certain districts called *Landgravates*, namely, those of Theringia, Hessia, Alsace, and Leuchtenberg. There are also counts of the empire who possess this title, but who are not princes.

LANDGRAVATE, the territory, office, or jurisdiction of a landgrave.

LANDGUARD, a fort at the entrance of the rivers Stour and Orwell, opposite to Harwich, erected for the defence of that port. It is occupied by a small garrison, with a governor, for the defence of that coast.

LANDLOCKED, a term applied to a ship when she is surrounded by land, so as to be safe from the violence of the sea or wind.

LANDRECY, a town on the Sambre in France, 19 miles south-east of Valenciennes.

LANDSCAPE-GARDENING, or Ornament-Gardening, is the art of laying out grounds according to the principles of taste, and suitable to the character of the objects and scenery which furnish the materials for this art. For a brief view of some of its principles, and a reference to works that have been written on the subject, see Gardening.

LANDSCAPE-PAINTING. See Design.

LAND-TAX. See Tax.

LANGENTHAL, a large village of the Canton of Berne in Switzerland, is about 18 miles from the city of Berne, and is famous for the manufacture of linen and ribbons, as well as for the extensive bleachfields in the vicinity. At the annual fairs, a

Langholme || Langhorne.

great quantity of cloth and cheese is sold for exportation.

LANGHOLME, a village of Dumfries-shire in Scotland, is finely situated near the banks of the Esk, and, including the population of a new village at a short distance, contains more than 2000 inhabitants.

LANGHORNE, John, an English poet and miscellaneous writer, was a native of Westmoreland, and was born about the year 1735. The early part of his education was chiefly conducted at Appleby, where he was fortunate in having for his teacher a person equally distinguished for classical literature and elegant taste. Under his tuition he remained till the age of 18; and as the death of his father, who had been a clergyman in Lincolnshire, left him in narrow circumstances, he was precluded from the advantage of pursuing his academical studies, and engaged himself as tutor in a family in the neighbourhood of Audley-park, the beauties of which called into exertion his poetic talents. The composition, being the first avowed production of his muse, was given to the public. Soon after, he was engaged as assistant in the free-school of Wakefield, and, having entered into clerical orders, he acquired some celebrity as a preacher. In 1759 he was again employed as tutor in a private family, and, greatly to the credit of his benevolence, he made a collection of such miscellaneous poems as he had written, and published them for the benefit of a person in embarrassed circumstances. In the succeeding year he entered his name at Clarehall, Cambridge, for the purpose of obtaining a degree in divinity, and from that place he dated poems on the king's accession and marriage, which were printed in the University collection.

While officiating as a curate in Essex, he became more generally known as a poet by several compositions; and about the same time he appeared as a prose writer, in his "Letters on Religious Retirement, Melancholy, and Enthusiasm," and "Solyman and Almena," an eastern tale. He also exercised his critical skill, and, it is said, indulged in a vein of ridicule, which at least did not add to the number of his friends, in contributions to the Monthly Review. In 1763 appeared his letters of Theodosius and Constantia; and next year he removed to London, where he was appointed to the lectureship of St John's, Clerkenwell, and in the same year he published two volumes of sermons under the seemingly affected title of "Tracts of Religious Philosophy." After his nomination to the place of assistant preacher at Lincoln's Inn, he presented to the world "Letters on the Eloquence of the Pulpit;" and his "Letters to and from select friends, or Effusions of Friendship and Fancy," which added to his celebrity as a sentimental writer. His "Genius and Valour," a pastoral poem, in which he vindicates the natives of Scotland from the abuse of Churchill and other party writers, is said to have procured for him the degree of doctor of divinity from the university of Edinburgh.

Langhorne || Langres.

In consequence of his marriage with a daughter of the family in which he had been tutor, a living in Somersetshire was procured for him; and ten years afterwards he was presented to a prebend in the cathedral of Wells. Dr Langhorne was twice married, and twice had the misfortune to see the object of his affection torn from him by death after a short union. He died in 1779.

Besides the works already alluded to, Dr Langhorne was the author of Letters of St Evremont and Waller; Frederick and Pharamond, or the Consolations of Human Life; Fables of Flora; The Origin of the Veil; The Country Justice; and Owen of Carron; and, in conjunction with his brother and a clergyman, a new version of Plutarch's Lives. As a prose writer, Dr Langhorne possesses facility, elegance, and tenderness; although his style is charged with being rather light and flowery, than serious and natural. His poetry is generally harmonious, abounding in pleasing imagery, but overloaded with ornament, and not free from obscurity and affectation.

LANGPORT, a market-town between Crewkern and Bridgewater, on the river Parrot in Somersetshire, governed by a portreeve and a recorder, 132 miles from London.

LANGREL-SHOT, a most formidable and destructive shot used at sea, having half a ball of iron fixed at each end of a chain. It is intended to cut up and destroy the enemy's rigging.

LANGRES, a town of the department of Upper Marne in France, is situated on an elevated spot, contains more than 7000 inhabitants, and has been long celebrated for the manufacture of paper and hardware.

LANGUAGE.

Language.

Definition.—The word *Language,* deduced by Dr Johnson from *language,* French, and *lingua,* (*the tongue,*) Latin, and defined by him, briefly enough, "*human speech, the tongue of one nation as distinct from others, style, manner of expression,*"—may be held more extensively, as denoting "the means by which sentient and intelligent creatures communicate their feelings and thoughts." Thus we speak, not inaccurately, of the language of brutes and of the language of birds; intending thereby all those signs, whether audible or visible, by which their social converse is carried on; and, with equal propriety, we apply the term to certain modes of interchanging and propagating our ideas, opinions, and sentiments, altogether independently of the *tongue,* that bodily organ, from the common employment of which, in discourse, the word language, as we have seen, is derived.

It is, then, in its largest or most extensive sense that we shall employ the term in the following essay; and we therefore propose to comprehend under it a great variety of subjects, which, though intimately and essentially connected, have been generally treated under separate titles, in dictionaries of art and science.

Division and arrangement.—Language, according to the view we take of it, is of three kinds—natural, representative, or similitudinous, and arbitrary or conventional,—all of them agreeing in the object to be attained, but differing in the mode by which that object is accomplished.

1. *Natural language*,—the origin and operation of which are spontaneous, constitutional, and uninfluenced by, or, at least, not the result of education, consists, (1.) of numerous actions, positions, and attitudes of the body or bodily members, all of which are significant, and are understood to be significant of certain internal impressions, emotions, propensities, and feelings; (2.) of peculiar expressions of the features of the face, those parts of the material systems of the more perfect animals which are allotted to the manifestation of the intelligent sentient principle that animates them; and, (3.) of certain modifications of the voice, effected, either altogether involuntarily, or at least without convention and concert, by the action of the respiratory organs. Natural language is common to man and the lower animals, and its diversities are respectively appropriate to their various classes and species; while its fundamental principles are so universally distributed among them, as to form something like a basis for general communion, and, by constituting part of their instinctive hereditary endowments, imply the identity and the design of that power which formed them. Under this head, then, are to be considered the naturally expressive or significant actions, postures, and habits of animals, those peculiarities of the countenance which furnish the materials of what is called physiognomy, and the spontaneous intelligible cries, the exclamatory and otherwise modulated utterances of many of the brute creation, and of man, whether in a state of nature or as occasionally affected by merely natural emotions.

Natural language, thus considered, exemplifies at once the wisdom and the goodness of the Deity. It manifests also the wide diffusion of a social principle. Animals, in a state of nature, have various feelings in common; and nothing can be more certain, than that many of them possess and exercise the power of corresponding with each other, in regard to what they experience passing within themselves, or as to their individual conditions of being. The co-relations of male and female, parent and offspring, present unequivocal evidence of this interchangeable diversity of existence. Whatever the principle which operates in those cases may be, it displays itself with an energy and a distinctness which may fairly be allowed to surpass the highest efforts of verbal eloquence. Man, proud of the acquirements of industry and art, may despise it, because it does not seem to indicate any of his cultivated reason, and because it must be assigned exclusively to those mysterious laws which regulate the phenomena of life, and which have hitherto eluded his inquiry; but, surely, it is as much the duty of sound philosophy to record what it observes, though irreconcileable with any known theory, as it will ever be the delight of genuine piety to admire the adaptation of means to ends in animal life, though the examples in which it is discovered should triumph over the boasted attainments of civilization and science. A volume might be written on the social affections and the reciprocity of the lower animals; and for the existence, as well as the display of these, it is obvious that something corresponding to language, taken in its largest sense, is essentially requisite. The intelligent reader will recollect too many striking instances of the kind, to hesitate giving assent to this proposition; and as to one of the connexions or relations alluded to, that of mother and offspring, as exhibited throughout nearly the whole range of animated nature, a force of testimony might be adduced which ought utterly to overwhelm scepticism, and which, indeed, can scarcely fail to impart condemnation to no inconsiderable portion of our own species. In such cases we may frequently find a combination of all the three constituents of natural language, as intelligible actions, expressive modifications of countenance, and significant tones of voice. The sacred Scriptures allude to some of these examples of truly eloquent tenderness, and do not scruple to use them in the way of simile, to denote interpositions of divine mercy: "As an eagle stirreth up her nest, fluttereth over her young, spreadeth abroad her wings, taketh them, beareth them on her wings; so the Lord alone did lead Jacob, and there was no strange god with him." "O Jerusalem, Jerusalem, how often would I have gathered thy children together, even as a hen gathereth her chickens under her wings, and ye would not."

So far, it may be said, the language, allowing it to be such, is all on the part of the parent. But, besides that it is understood in its full import by the young, any one who will notice the accuracy with which the ewe recognizes its own lamb, by its bleating, in the midst of a large and a clamorous flock, cannot fail to be convinced of the readiness with which even one of the simplest of the brute creation, and that too in its earliest stage of life, enunciates its feelings and wants, and is answered by the individual that is most interested in its welfare, and best able to promote it.

Where so many instances might be adduced of like import, and directly in proof of the same assertion, it is unnecessary to have recourse to any abstract or general reasoning; but it may safely be remarked, that the immense variety in the voices and notes of the lower animals, more especially among the order of birds, seems intended to aid the converse of the different species, and ought not to be considered as a superfluity of sound, or destined merely for the gratification of a musical ear. Thus, there are diversities well known to belong to the distinct species, by which they may as readily be distinguished as by any other of their physical peculiarities; and individuals of the same species are often to be characterized by minuter modifications, which are undoubtedly understood by one another. A similar observation may be applied to all the constituents of natural language; and hence, as well as in consequence of differences in their form, dimensions, and other particulars, the huntsman unerringly applies the appropriate names to his pack; and the shepherd, without having given them names to which they answer, can point out individual members of his flock, and even teach his dog to distinguish them. To what extent the influence of natural language may be carried among the lower animals, it is, perhaps, impossible

Natural Language.

Natural Language.

for us to determine; but we need only to credit, as there is good reason to do, the descriptions which have recently been given of the communities of certain insects, as of the ants, to be satisfied that it is much greater, and that the communications are both more minute and more perfect than, judging from the comparatively little benefit which we ourselves derive from this agent, we should at first sight think attainable. Here also it would be requisite to take into account those instances in which animals of different orders and species, and sometimes of the same, are affected towards each other, by very opposite feelings, namely, hostility, and a sense of fear; and these resulting not from experience, though often, indeed, strengthened by it, but from the actual propensities, susceptibilities, and antipathies of their nature. The roaring of the lion, which is said to cause almost every other beast of the field to tremble, is not the only specimen that might be mentioned of such easily interpreted language; nor is the voice the only agent employed in it, as any one will admit who has ever witnessed the hostile attitudes, the array of weapons, and the scowling looks, assumed by some of our domestic animals in their rencounters. The erect hair, arched back, and swelled tail of the cat, are as justly appreciated by her common enemy, the dog, as her half suppressed grumbling and indignant hiss.

Some particular examples of the language of the lower animals may prove both amusing and instructive to the reader.

Homer represents the horses of Achilles as weeping for the loss of their master. This is possibly a poetic idea; but Homer is not singular in ascribing grief to those noble animals, which, if their countenances can at all be understood on the principles of physiognomy, are perfectly susceptible of that passion, as they obviously are of satisfaction, joy, and sundry other emotions. That they are capable of communicating their feelings and thoughts to one another, is matter of common remark among those who are best acquainted with their habits; and, perhaps, it may be worth while mentioning, that in a state of nature, and when living in a country infested with certain ferocious animals, they are understood occasionally to combine together for defence, by forming a circle, their heads being pointed inwards to the centre, and their hinder legs kept in readiness to fling outwards on an assailant. That this is not their only, nor, in one sense, their natural method of contending with an enemy, is certain; for when alone, or unsupported by several of his species, the horse has been known successfully to attack a bear, or to defend himself against that animal, with his fore legs; and, on the contrary, he is sure to be overcome by him, if, by turning round, he make an attempt to strike him from behind. It is usual for them, in like circumstances, to have sentinels, whose duty it is to warn the herd of any approaching danger; and this they perform by a loud neigh, on which their comrades gallop off with rapidity. The beautiful description of the horse, given in the book of Job, implies a variety of thought, and emotion, or feeling, and ascribes to each a corresponding action: "The glory of his nostrils is terrible. He paweth in the valley, and rejoiceth in his strength: He goeth on to meet the armed men. He mocketh at fear, and is not affrighted; neither turneth he back from the sword; the quiver rattleth against him, the glittering spear, and the shield. He swalloweth the ground with fierceness and rage: neither believeth he that it is the sound of the trumpet. He saith among the trumpets, "ha, ha;" and he smelleth the battle afar off, the thunder of the captains, and the shouting." Figurative as these expressions must be reckoned, the picture will scarcely be deemed an exaggeration by persons who have had opportunities of studying the capabilities of this creature, especially those varieties which are usually trained to the purposes of war and the chase. The position of a horse's ears is often quite decisive of the emotions he experiences. Instances of the *expressed* generosity and kindness of horses, their *apparent* veneration for our own species, and sundry other benevolent dispositions, are probably familiar to most readers. But that they have feelings of a different kind, and can energetically manifest that they have them, is equally matter of fact, though perhaps less generally known. Two examples may suffice: A carthorse, standing at the edge of a wharf or quay, was for some time annoyed by an ill-natured cur, whose snarling, and repeated attempts at biting, prevented him enjoying the cessation from work. Irritated, at length, by such vexatious, though not at all formidable behaviour, he availed himself of the favourable position of his paltry assailant, to lay hold of him by the collar with his teeth, and, lifting him fairly from the ground, soused him at once into the water. The other case was likely to have proved more serious. A gentleman had a fine hunter, which he one day cruelly determined completely to fatigue, if possible. For this purpose, having dined, after a long chase, he remounted him, and rode him for a considerable time in a hilly country, till the animal seemed quite exhausted, and was hardly able to walk home. The gentleman, shortly afterwards, went into the stable, when the horse made an assault on him, which, in all probability, would have proved fatal, had not a servant been fortunately present and interfered to rescue his ungenerous master. The story of Misagathus, related by the poet Cowper, may be considered as somewhat similar, and will doubtless be remembered.

Of the sagacity of dogs, it is unnecessary to speak. Their employment of natural language, so as either to denote it to our senses, or to correspond with each other, cannot be questioned. Much of what they are known to do, in respect to the former point, may undoubtedly be traced to the peculiar training they receive from man; but still there is a fundamental principle in their constitution on which their education itself must proceed; and as to the latter particular, their ability mutually to communicate their thoughts and feelings, the existence and the operation of a natural faculty, intended for, and competent to the end, seems quite unequivocal, though it may be very inexplicable. Their acting in concert, in a variety of circumstances, might possibly be accounted for on the ready and correct supposition of their being influenced by the same exciting cause, as in the sports of the field. But it is impossible, in this manner, to explain such an instance of co-operation as the following, which is all that can be admitted here in illustration of the social intercourse of this species. The substance of the story is found in Mr Bingley's Animal Biography, and appears to rest on an authority to which entire credit is due. A gentleman of Whitmore, in Staffordshire, who commonly visited London twice a-year, travelled on horseback, accompanied by a small terrier dog, which, that he might not lose him in town, he was accustomed to leave in care of his landlady at St. Albans, till his return homewards. On one of these occasions, he asked, as usual, for his faithful companion. "Alas, Sir," said the landlady, who appeared with a woeful countenance, "your terrier is lost! Our great house-dog and he had a quarrel; and the poor terrier was so worried and bit before we could part them, that I thought he never could get the better of it. He, however, crawled out of the yard, and no one saw him for almost a week. He then returned, and brought with him another dog, bigger by far than ours; and they both together fell on our great dog, and bit him so unmercifully, that he has scarcely since been able to walk about the yard, or to eat his meat. Your dog and his companion then disappeared, and have never since been seen at St. Albans." The gentleman, consoling himself for his supposed loss as he could, soon after arrived at Whitmore, where he found the terrier. On inquiry, he learned that the little creature had, a short time before, been in Whitmore, where he contrived to engage in his cause, and whence he had conducted the giant friend, by whose powerful aid his injury at St. Albans was so triumphantly avenged.

A practised observer can at once determine whether a dog is pleased or offended, from the position and motion of his eye-brows; and the waving or wagging of his tail is a well known characteristic of his satisfaction.

Parental affection was probably never more eloquently expressed than in the instance of a white or polar bear, an animal well known to partake largely of the feeling, as observed by the crew of the Carcase frigate, when on a voyage of discovery towards the North Pole. Early one morning, the man at the mast-head apprised his comrades of the approach of three bears on the ice, invited, it was imagined, by the smell of the blubber of a sea-horse that had been killed some days before. When they came near enough to be distinctly seen, they were discovered to be a female with her two cubs, these being nearly as large as herself. The crew, purposing their destruction, threw out some of the bait by which they had been attracted, and which the old bear, taking away the pieces singly, laid before her cubs in shares, reserving only a small portion for herself. As she was carrying away the last piece, the sailors levelled their muskets at her cubs, and shot them dead, the dam herself also receiving a severe injury. "It would have drawn tears of pity from any but unfeeling minds," says the narrator of the story, "to have marked the affectionate concern expressed by this poor beast, in the last moments of her expiring young. Though she was herself dreadfully wounded, and could but just crawl to the place where they lay, she carried the lump of flesh she had fetched away, as she had done others before, tore it in pieces, and laid it before them; and when she saw that they refused to eat, she laid her paws first on the one, and then upon the other, and endeavoured to raise them up. All this while it was pitiful to hear her moan. When she found she could not stir them, she went off, and when she had got to some distance, looked back and moaned, and that not availing her to entice them away, she returned, and, smelling round them, began to lick their wounds. She went off a second time, as before, and having crawled a few paces, looked again behind her, and for some time stood moaning. But still her cubs not rising to follow her, she returned to them again, and, with signs of inexpressible fondness, went round them, pawing and moaning. Finding at last that they were cold and lifeless, she raised her head towards the ship, and uttered a growl of despair, which the murderers returned with a volley of musket-balls. She fell between her cubs, and died licking their wounds."

A sense of common danger is manifested in a herd of cattle, on the approach of a dog, by their general movement towards him, and still more remarkably on the appearance of a wolf, by their forming a sort of hollow-square, and enclosing their young ones in the centre, the bull, as protector and governor, taking his station so as to encounter, and, if possible, repel the aggressor. In fact, the principle of common defence, and of concerted action or position in order to effect it, is universal among gregarious animals, and cannot well be understood but on the theory of their possessing and exercising a species of language. In the same manner, and perhaps still more distinctly, must be explained the fact of certain animals communicating to each other the discovery of food, as is familiarly exemplified in the case of the dung-hill cock, who most politely calls his family to the repast, of which he will not partake till they have obeyed his summons.

In regard to the diversities of sound, as characteristic and communicative of different feelings, we need be at no loss for illustration. The only difficulty is in the selection of examples. Some have been already given, but a few more may be offered. Two general remarks may be premised. In the first place, then, it is an established law, that different species of animals have distinct and peculiar modifications of sound, by which they may be recognized; and, secondly, that individuals of the same species express the same feelings by the same or similar sounds. For instance, among the feathered tribes, which afford the most unequivocal proofs of the existence of this kind of natural language, geese and ducks are quite distinguishable from each other by their respective sounds, and both differ essentially, in this respect, from the common fowl and the turkey-cock family. But a member of each of these varies its voice according to the feelings it has to express or communicate, and in these variations is resembled and seemingly understood by every other member of the species. The language of their infancy, or that state in which they are dependant on the care and guidance of their parents, is materially different from that of their advanced periods; and the sensations or emotions of pain, fear, anger, and contentment are perfectly and distinctly intelligible in them at all times. But the modifications of voice among certain birds are extremely numerous. It is not unreasonable to think that they are all significant, and thus their language may be much more minutely expressive than is commonly imagined. The observations of naturalists confirm this idea, for they all specify the changes of voice that take place at different seasons of the year, in connexion with the operations by which the species are propagated and preserved. Some of these changes are well known, and many more, it is probable, might be ascertained, and referred to their appropriate sources, if due attention were paid to the subject. Thus, mention is made in a respectable journal, the Quarterly Review, (No. XXXV.) of an artist then living, who, it appears, had so carefully studied the language of birds, as to have been able to tell by the notes of the mother where her nest was, and whether it contained eggs or young ones, with sundry other particulars.

Another individual has enumerated no less than 25 modulations in the cawing of crows; but though each of these may possibly be intelligible to the members of the sable community, it is not pretended that the curious observer has actually determined their precise significations. The following is the list of their vocables:

Cra, cre, cro, crow, croow.
Grass, gress, gross, grouss, grououss.
Crue, crèa, croà, crouà, grouass.
Crao, crèo, croè, croue, grouess.
Craow, crèow, croo, crouo, grououous.

Connected with what may be called the language of birds is their *song*, which, though strictly speaking founded on their physical construction, and consequently appropriate and peculiar to the various species, is greatly influenced by education and example. It is evidently imperfect in the nestling, and gradually improves as the bird advances to maturity. How much it may be modified by education and the force of example, is shewn by familiar instances of imitation. Thus, a sparrow, placed when very young near a goldfinch and a linnet, acquired a song that was made up of the notes of both birds. "Three linnets of the same nest, (says Mr Bingley,) were placed one under a sky-lark, another under a wood-lark, and the third under a tit-lark; and, instead of the song peculiar to their own species, they adhered entirely to that of their respective instructors." Similar experiments have been made on other birds. "I educated, (says the Hon. Daines Barrington,) a nestling robin under a wood-lark linnet, which was full in song, and hung very near to him for a month together; after which, the robin was removed to another house, where he could only hear a sky-lark linnet. The consequence was, that the nestling did not sing a note of wood-lark, (though I afterwards hung him again just above the wood-lark linnet,) but adhered entirely to the song of the sky-lark linnet." Thus, linnets, taken from the nest, and put in the company of nightingales or larks, have been made to acquire the musical notes of those birds; and the natural song of the canary is sometimes exchanged for that of its companion. These are examples of imitation and acquisition, which imply natural language almost as strongly as the common and universally known instances of adopted dialects among our own race; and they are not inferior in importance, as illustrative of the principle, to the case of the magpye, starling, parrot, and several other birds, which, though they can be taught to utter a great variety of arbitrary sounds, cannot be imagined to understand them, or to be capable of entertaining the ideas with which they have been conventionally associated. Perhaps the most extraordinary instance of imitation among the feathered tribes is that of the American mock-bird, which, besides its own very numerous notes, can execute almost every animal modulation, from the mewing of a cat, or the barking of a dog, to the scream of an eagle, or the dreadful voice of the wolf. The Mexican name for this singular little creature, "The Bird of Four Hundred Tongues," indicates the marvellous power by which it is said to deceive, when it pleases, every bird of the forest. There needs no other proof of the existence, and the widely diffused influence, of natural language among the lower animals.

Let us ascend to our own species. Man in the earliest stages of society makes great use of natural language; and is certainly not less amply endowed with its materials than the inferior creatures. Much of it is superseded, in his progress towards civilization and refinement, by the adoption and the improvement of arbitrary language; but there is, perhaps, no period of his history in which it is entirely abrogated. Witness the gestures with which he frequently accompanies what he speaks, especially when energetic; his manner of pointing out places by the direction of his fingers; the elevation of his hands in adoration, or when impressed with a sense of awe; their easy expansion, and the extension of his arms, when he invites approach, or shews a friendly disposition to persons at a distance; the clenching of the fists, and the angular position of his elbows, when on his guard against an opponent, or meditating attack on an adversary; besides many corresponding attitudes of the body and movements of the head, the contortions of some of the muscles of his face when agitated by the angry passions, its lively and engaging aspect when he is pleased; the pity-craving seriousness of grief; the rigidness of authority; the abandoned pliancy and the coarse clangour of merriment; not to speak of the sighs and groans, the hisses, and shouts, and screams, and ejaculatory exclamations of which the human voice is capable, previously to the superinduction of arbitrary language. It cannot be doubted, that, by the use of these means, mankind in a savage state might apprise each other of many of their impressions and wants; and it is certain, that persons travelling in countries, the spoken language of which they do not understand, are materially indebted for their comfort and safety to the employment of such, and to the adoption of several imitative actions.

But, besides its distinctness and general efficacy, it may be remarked, that natural language is generally sincere, that is, it is rarely used, or can scarcely be used, without the existence of the internal feeling, or the presence of the thought or emotion by the influence of which it is conceived to have been excited; and in this respect it differs considerably from the language of convention, which, being dependant almost altogether on a process of simple intellect, or resulting in great degree from the memory, may be employed, and unfortunately often is employed, where there is no real feeling or sentiment with which it corresponds. Thus, it may be observed in society, there is sometimes a marked opposition between the words of a person and the expression of his countenance, one glance of his eyes or a single quiver of his lips giving distinctly the lie to what he says.

The lower animals are not unaware of this contrariety on the part of man. Dr Spurzheim, in his lectures, used to instance the example of a dog, which, as he happily enough expressed himself, would pay no attention to any smooth or flattering words, whilst the speaker at the same time lifted up a stick in order to strike him. "He will regard, not your artificial language but your natural, not what you say to him, but what he sees you do." Children are greatly affected by natural language, and seem to be good judges of it, even before they have acquired any intimacy with arbitrary or artificial signs. The perfect adaptation of one to the other, that is, the correct combination of natural with arbitrary language, is generally much more powerful in its effects than either of them singly. Thus, a degree of action is usually prescribed to the orator: and it is doubtful whether, in the dramatic art, the former, which is essential to its excellence, is not also fully more operative on the spectator than the latter; so necessary is it, as Hamlet says, "to suit the action to the word, and the word to the action."

Cicero, one of the greatest orators of antiquity, and one of the few masters in the art whose writings on the subject have come down to us, with much propriety denominates *action, the language of the body*; and, according to his own account, he had frequently compared its effects, as displayed by the comedian Roscius, with those of words. There are many cases in which it is the more powerful agent, both in conveying information and influencing the passions. Its importance may therefore justify a few additional remarks.

Judging from the practice of the ancients, it seems to have been usual, in making an address to an assembly, to rise and speak standing. Thus, it is said of Abraham, that he "stood up, and spake unto the children of Heth," when requesting to be put in possession of a burial place; and it is likely that he sat down on having concluded his speech, for immediately after their friendly reply to him, he is described as standing up again, and *bowing* "to the people of the land." Gen. xxiii. The two actions of standing and bowing appear to have been understood as expressive of respectful attention, and courteous, if not grateful, esteem. Homer represents the princes of Greece, assembled on occasion of the Trojan war, as *standing* up, when they addressed the army, or spoke in council. And Achilles, when he made inquiry as to the cause of the plague which then afflicted the Greeks, is described as rising to speak, and sitting down on the conclusion of his speech. Calchas the prophet, who succeeds him, also rises; and, on another occasion, both Agamemnon and Nestor rise when about to address the council. (See first and second books of the Iliad.) And, thus, we are informed by Cicero, (*In Catil.* iii.) that Lentulus, accused of being an associate of Catiline, stood up to make his defence. Many other examples might be given; and it is believed there are few people among whom the same practice has not been adopted. The advantage of being heard is perhaps not the sole reason for it, though certainly a good one. It seems naturally to suggest itself to one who feels interested in what he is about to utter; and, besides its being calculated to excite attention from an auditory, it gives the speaker a greater power of using his bodily members than he could have in a sitting posture. To this observation it may be added, that sitting implies a degree of ease, if not authority, which does not seem suitable to one who has to solicit regard or conciliate favour. Accordingly, we learn from Suetonius, in the Life of Cæsar, that offence was taken at him, after arriving at supreme power, for not rising when addressed by the senate; though it is not clear whether the omission arose from pride on his part, or the circumstance of his gown being held by one of his friends.

The standing posture, as already hinted, is peculiarly favourable for the free use of those members, the motion or attitude of which can be rendered in any measure subservient to the purposes of oratory. As to these, the head claims priority of consideration, and the motions of it are highly and variously expressive. Self esteem and arrogance particularly manifest themselves by the elevation and retraction of the head; pressing it forward a little seems to express anxiety; to stretch it out beyond a certain distance probably denotes awkwardness and want of management; to hang it down, as if it rested on the breast, shews timidity and bashfulness, if not the consciousness of impropriety and guilt; and its leaning to either side, as if it were supported on the shoulder, seems to indicate indifference, and a careless or slothful state of mind. Aversion is powerfully expressed by turning the head towards one side, while a hand is stretched out on the opposite. A slight inclination of the head sideways, so as to raise the face a little, betokens listening; and depressing the back part of the head in such a manner as to raise the face towards heaven, the eyes at the same time being directed thither, is highly designative of a devotional feeling which recognizes and implores the aid of divine power. Various motions of the head might be noticed as significant. There is the nod of approbation, a peculiar cast or fling expressive of contempt or disdain, the shake of anger, and the tremour of fear. During lively narrations, the head is frequently turned from side to side, but in a gentle manner. The affectation of superior wisdom and conceit are sometimes disclosed by a sort of movement intermediate between a shake and a nod. In calm, serious discourse, the head is usually kept steady. These remarks, which might be a good deal extended, are enough to prove the amazing influence of this member considered as an organ of language.

Still more expressive are the features of the face, by which, independently of words, every passion and emotion may be represented so as to be quite intelligible to others. Even the dispositions of the mind, the permanent characters of individuals, and not unfrequently their intellectual habits and capabilities, are strikingly and unerringly pourtrayed in them. Some of the most commonly marked signs may be mentioned. In anger and resentment, the forehead is contracted, the eye-brows are drawn towards each other, and the lips are somewhat thrust out; under the influence of fear, especially when in a great degree, the forehead and eye-brows are raised upwards; grief or sorrow causes them to assume a lowring appearance, and the cheeks to hang down; the emotion of joy, on the other hand, expands them, but contracts the cheeks, and draws up the corners of the mouth. How wonderfully eloquent, again, are the eyes! By them alone, in reality, all the passions of the soul are expressed, with a velocity, an intensity, and a correctness, which no artificial language can accomplish. We readily discover a person's intention, and his feelings towards us, by what we call his *looks*, or, in other words, the expression of his eyes; and it is to these, much more than to any spoken words, that we have recourse, on the most ordinary occurrences, in order to determine any changes of mind that may be taking place among our companions. " In speaking upon pleasant and delightful subjects," says Ward, in his System of Oratory, from which some of these remarks are taken, the eyes are " brisk and cheerful; as, on the contrary, they sink, and are languid, in delivering any thing melancholy and sorrowful. This is so agreeable to nature, that, before a person speaks, we are prepared with the expectation of one or the other from his different aspect. So likewise, in anger, a certain vehemence and intenseness appears in the eyes, which, for *want of proper words* to express it by, we endeavour to represent by metaphors taken from fire, the most violent and rapid element, and say in such cases, the eyes *burn, sparkle*, or are *inflamed*. In expressions of hatred or detestation, it is natural to alter the look, either by turning the eyes aside or downwards." This last motion sometimes expresses modesty. Giddiness and want of thought are indicated by a staring look; a fixed look often implies intenseness of thought, " but at the same time shews a disregard to the audience; and a quick wandering motion of the eyes denotes levity and wantonness." There is a contraction of the eyes which impresses us with the idea of cunning and design; and the author of Hudibras whimsically alludes to another motion of them, characteristic of religious fanaticism, if not hypocrisy :

" As men of inward light are wont
To turn their optics in upon't."

In regard to other parts of the body, it is perhaps sufficient to take notice of the hands and arms. Of the power of the former, as an organ of language, Quintilian speaks largely: " They have a greater variety of motions than can well be expressed; for they are almost equal to our words. Do not we desire with them, promise, call, dismiss, threaten, beseech, detest, fear, inquire, deny? Do not they express joy, sorrow, doubt, confession, penitence, measure, plenty, number, and time? Do not they excite, restrain, prove, admire, and shame? That in so great a variety of speech among all nations and countries, this seems to me the common language of mankind." (See his *Inst. Orat.* lib. xi.)

Considering the practice of the ancients, founded on natural principles, which it seems to have been, Ward deduces from it the following preceptive remarks: " All bodily motion is either upward or downward, to the right or left, forward or backward, or else circular. The hands are employed by the orator in all these except the last. And as they ought to correspond with our expressions, so they ought to begin and end with them. In admiration, and addresses to heaven, they must be elevated, but never raised above the eyes; and in speaking of things below us, they are directed downwards. Side motion should generally begin from the left, and terminate gently on the right. In demonstrating, addressing, and on several other occasions, they are moved forward, and in threatening sometimes thrown back. But when the orator speaks of himself, his right hand should be gently laid on his breast. When no other motion is necessary, the hands should be kept about as high as the breast, so as to make near a right angle with the arm. This is not only graceful, but likewise the most easy posture, and gives the least strain to the muscles. They should never be suffered to hang down, nor to loll upon the cushion or bar. The left hand should never move alone, but accommodate itself to the motions of the right. In motions to the left side, the right hand should not be carried beyond the left shoulder. In promises and expressions of compliment, the motion of the hands should be gentle and slow; but in exhortations and applause, more swift. The hands should generally be open; but in expressions of compunction and anger, they may be closed. All finical and trifling actions of the fingers ought to be avoided, nor should they be stretched out and expanded in a stiff and rigid posture, but kept easy and pliable. Neither the breast nor the belly should be thrust out, which in itself looks ungainly, and hinders the free motion of the trunk, which ought not to be kept too stiff and upright, but easy and flexible, always suiting itself to the motion of the head and hands. The feet should continue steady, and not give the body a wavering and giddy motion by frequently shifting." Some of the ancients appear to have used several vehement actions, especially of the arm. Thus Philip, a Roman orator, used to say, he was never able to speak till he had " warmed his arm," an expression which denotes its free if not violent exercise; and Cicero calls *the arm projected, the orator's weapon*. A peculiar extension of it, or what is understood by the term brandishing, conveys the idea of authority and consequence, which can suit those only who have acquired distinction and command. On this account, probably, young orators, both Greek and Roman, were accustomed for a time to use no motion of the arm, but to confine it in their garments, till, from age and experience, they might be supposed entitled to greater freedom.—Among the particular movements of this member occasionally adopted, may be mentioned what was denominated *the percussion of the thigh*, an action very appropriate to forcible reasoning or the energetic conclusion of a pointed and well arranged sentence, and said to have been a good deal employed by the late Mr Pitt.

The tones of the voice are certainly as much concerned in natural language as the motions of the bodily members, and the expressions of the countenance. They, therefore, merit a few observations. The various passions of the mind, besides their power in producing action or gestures, have appropriate tones of voice by which they express themselves, and may often be distinguished, even without paying regard to the words that accompany them. Joy, for example, raises and expands the voice. Grief, on the contrary, depresses and contracts it. Anger and resentment occasion a roughness or harshness of tone, and a tendency to faltering or interruption. When the mind is calm the voice is usually moderate, and even in love and tenderness it is usually smooth, gentle, and cheerful; under the influence of fear, it trembles and hesitates; whereas confidence or boldness gives it firmness and strength; and by admiration it is elevated, and acquires grandeur or fulness of tone. Here, then, as in the case of action, it is evident sundry errors might easily be committed, and nothing is more certain than that they frequently are committed; and the never-failing consequence is, an inconsistency or want of harmony, totally destructive of the effect intended.

The following practical observations on the subject may prove acceptable to some readers, and serve as a counterpart, or rather companion, to those on gesture or action. Supposing each of the passions to have its peculiar tone of voice, by which it would express itself in inarticulate sounds, as we find occasionally exemplified in interjections and other exclamations, it is reasonable to conclude, that the adoption of a corresponding variety, arising of course from natural feeling, will materially aid the intended operation of articulate language. Hence the propriety of the general principle on which the ancients, and some of the moderns, inculcate attention to the management of the voice in oratory. Diversity of tones, then, being evidently the work of nature, and there being a ready and expert judge in the human ear, nature herself must be consulted by those who have to speak in public. The most essential direction is, that the tone of the voice be natural and unaffected, or, in other words, that it be suited to the subject. The object of the orator ought to be, to fill the place in which he speaks, but without exceeding or deviating from his natural key. Inattention to this particular will occasion either a harsh, rough voice, or one that is so shrill as to approach to a squeak; and, moreover, will prevent the distinct articulation of his words. The voice ought always to be kept within management, so as to be capable of such elevations and depressions as are required to correspond with the varieties of feelings and sentiments which are to be expressed, and this is rendered almost impossible when the tone is higher than what is natural and habitual to the individual. It is a common error to imagine, that, in order to *raise* the voice, as it is called, a person must assume another key than that to which he is accustomed. In reality, a *low* note may be as loud or as strong as a *high* one, and the difference in audibility of the voice does not depend so much on its *pitch* as the *force* with which it is delivered. But the voice may also be too low of tone, that is, under the natural key; and in this case the speaker both finds it difficult to rise where elevation is required, and is of course prevented from accomplishing depression where it is suggested by the subject. Sudden variations in tone are rarely needed, and generally have an unpleasant effect. To avoid the extremes of highness and lowness, the speaker ought to aim at calmness and moderation of tone, which is most consistent with distinctness of utterance, and most conducive to the production of those varieties in modulation which are at once expressive and agreeable. Variations in tone are not needed where they are not suggested by the transitions in the subject, and when superfluous are offensive, as indicating conceit and bad taste. On the other hand, monotony is painful, when contrasted with discovered variations in sentiment, as it implies want of feeling and interest. But there are occasions on which an approach to it is becoming, as in a course of grave instruction not addressed to the passions, and therefore admitting little variety of voice.

As to the celerity of the voice, or its degree of quickness and slowness, it is well known that some expressions require to be pronounced faster than others,—those, for example, which relate to lively and sprightly ideas,—whereas those that are of a melancholy or solemn nature are uttered, and ought to be uttered, deliberately and slowly. Rapid or hurried speaking is extremely apt to destroy the distinctness that ought to be maintained between the sentences, and prevents the words from having their due sound, or producing their full effect. It is apt, besides, to put the speaker out of breath, in which case he may be compelled very awkwardly, and improperly, to stop, in order to recover himself, and thus to lose the connection of his sentences and words, if not of the ideas which he intended to deliver. This is a common fault among young speakers, and probably arises partly from bashfulness, which occasions a hurry of mind, and partly from the desire of approbation, which prompts them to arrive speedily at a close. The opposite error, that of disproportioned slowness, betokens dullness or apathy in a speaker, and is quite inimical to that impassioned state of mind and attention, on the part of the hearers, which it is frequently his object and his duty to excite.

The following judicious remarks on certain qualities of voice are abridged from Dr Ward's work, already referred to. The chief qualities of the voice are *strength* or *weakness*, *clearness* or *obscureness*, *fulness* or *smallness*, and *smoothness* or *roughness*. Half of these is what every one would choose, as he would be free from the others. But, as it is not in our power to give ourselves what qualities of the voice we please, we must make the best use we can of what nature has bestowed. Several defects of the voice are capable of being helped, by care and proper means; as, on the other hand, the best voice may be hurt by ill management and indiscretion. Temperance is a great preservative of the voice, and all excess is highly prejudicial to it; for the voice must necessarily suffer if the organs of speech have not their proper tone, to which it is necessary that they be in a due temperature as to moisture or dryness. The superabundance of fluid will obstruct the clearness of the voice, and render it obscure and confused; and drought, or a parched state, on the contrary, makes the voice harsh and rough. Certain excesses, and some bodily indispositions, are apt to affect the organs in one of those two ways. A strong voice is serviceable, because he who possesses it is thereby enabled, whatever may be his other defects, to render himself audible; and should he at any time be forced to strain it, there is less danger of its failing him before the conclusion of his discourse. He who has a weak voice ought to be careful not to strain it, especially at first, but should begin low, and gradually reach such an elevation as his natural key will enable him to maintain without sinking; and for this end he will find occasional inflection very useful. Let him speak deliberately, so as to allow due pauses for free respiration. Proper exercise will greatly aid the attainment of a strong voice. A *clear* voice is one in which the organs of speech are suited to give every letter, and all the combinations of articulate sounds, their proper distinct enunciation. This is pleasing to the hearer, and a great advantage and ease to the speaker, as requiring little effort,—even a moderately weak voice, when clear, being much more distinctly heard than a strong one if thick and obscure. Deficiency in the organs, or faulty constitution, is not the only, nor perhaps the most usual, cause of obscurity and confusion of voice, which often arise from bad habit,—some persons, inadvertently, or, it may be, affectedly, running into an irregular manner of expressing their words; and this they do either by misplacing the accent, confounding the sound of the letters, or huddling the syllables together.

A full voice is not necessarily the same as a strong or a loud voice; and, though it may fill the ear, it is sometimes unpleasant,—to avoid becoming which, it requires to be frequently varied. But, on the whole, it is fitter for an orator than a small shrill voice, the possession of which, in a remarkable degree, has been known, of itself, to incapacitate a man from addressing a public assembly, in a manner, or with an effect, at all consistent with his admitted consequence and abilities. Those who have this misfortune ought to be cautious not to raise their voices to a high pitch, especially at once, as the sudden compression of the organs is apt to occasion a squeaking disagreeable sound. A *soft* and *smooth* voice, particularly if *flexible*, is highly musical; as, on the other hand, a harsh rough one is very inharmonious and unpleasant. On the whole, then, it appears, that the voice best fitted and most desirable for an orator, is that which is moderate, distinct, firm, clear, and smooth, and so flexible as to be easily accommodated to the several degrees and variation of sound which every part of a discourse may require.

In confirmation of the remark made above, as to the difference between high and low tones, the following passage is extracted from the Courier Newspaper of the 15th September 1823: " Sir Everard Home has recently made some interesting enquiries, by way of comparison, between the auricular organs of man and quadrupeds. The result of his researches seems to prove, that shrill tones, or the upper notes of an instrument, have comparatively little effect in exciting the attention of animals, while the full lower tones stimulate them almost to fury." Sir Everard observes, " that the effort of the high notes of the piano-forte upon the great lion in Exeter-Change only called his attention, which was considerable, though he remained silent and motionless. But no sooner were the flat or lower notes sounded than he sprang up, lashed his tail, and yelled violently, and endeavoured to break loose, and became altogether so furious as to alarm the spectators present. This violent excitement ceased with the discontinuation of the music. The deep tones of the French horn produced a similar effort with the lower tones of the piano-forte, on the elephant and other animals on which the experiment was made."

It may be profitable to add to these remarks on the subjects of gesture or action and the voice, the directions of Dr. Lawson, given in his course of lectures on oratory, delivered some years ago at Trinity college. They are chiefly designed for those who cultivate the science of the pulpit, but with very little trouble may be applied to all the purposes of public speakers. " There is one general observation, which, if we would consider it well, and keep ever in our minds, ready to be applied on all occasions, would, if I be not deceived, answer the end proposed by those and the like rules more fully. It may be traced out in this manner. Nature, we know, hath adapted to the sentiments and passions their proper look: She hath further, as we have just now seen, fitted to them their several tones of voice; and she hath in the same manner appropriated to each its own gesture. Anger, fear, love, hatred, admiration, astonishment, express themselves immediately, by involuntary changes in the features, in the attitude of the body, in the motion of its several parts, of the head, the eyes, and principally of the hand, the weapon of the orator, as one aptly names it, not less clearly than by the sound of the voice. The constancy and universality of this expression make some degree of action necessary, wherever the matter of the discourse is interesting; because, in such cases, it is natural, it is always expected; the want of it therefore disappoints, offends. You cannot be deemed sincere without it, and will not for that reason obtain belief, scarcely attention. This indeed is more variable from custom than are the tones of the voice. The inhabitants, for instance, of warmer climates, use more action than those of the colder; our neighbours on the continent more than we: Which difference we should regard, because universal custom is to be considered as nature. A scrupulous adherence to rules, the meditating and practising before-hand gestures, as affixing to each period, or member of each, its peculiar one, is, I believe, however recommended, very prejudicial. For the effort used in recollecting and applying these rightly, according to the pre-established purpose, employeth the mind, distracteth greatly its attention, and must embarrass the delivery; and the consequence will be, that you shall become, through this divided care, faulty in speaking, and affected in action. The better way is, after some general care in observing what is graceful, what unbecoming, make yourself perfect master of what you are to say, and of the manner in which you are to pronounce it. This done, leave your action to nature. She will faithfully attend, and accompany your sentiments and words, as they flow, with aptly corresponding gestures." And so as to the management of the voice. "We should endeavour to acquire that kind of pronunciation which approacheth most to the tone used in discourse by a wise and grave man, naturally eloquent, speaking on a serious and interesting subject. If I were to explain, by descending to particulars, wherein this kind chiefly consisteth, I would reduce it to this capital precept, *study variety*. This is the great dictate of nature. Observe her speaking in the young, the unlearned, or where passion throweth off all restraint,—she is for ever changing in accent, tone, emphasis. But herein keep always in mind one caution, *Vary so as still to become*. Beware of running into excess; for there are certain limits beyond which variety displeaseth. Variety, however necessary, should not be carried into irregularity. Ever change, it is the life of pronunciation; but change with sense, not for the sake of varying, but suitably to the sense. Observe nature well: trace her from her simplest elements up through every higher and more complex form, and adhere to her as closely as you can, with proper consideration of circumstances, of subject, place, and audience."

Intimately connected with natural language, and denoted by an expression which seems synonymous with it, is a subject of high importance and most extensive bearing, on which it may be allowed to enter for a little, in order to obtain some additional, and, it is hoped, useful confirmation of the general principles contended for in the preceding pages. We allude to

The language of nature,—that grand consentaneous system of instruction and intelligence held out to us in the works of creation and providence, from which it is next to impossible for a creature such as man not to deduce infallible and most impressive evidences of the existence and continual agency of a Supreme Being, the author, preserver, governor, and judge of the universe. The term is happily chosen and highly significant. All things around us, what we see, hear, feel, or by any other sense perceive, bespeak the wide-spread agency of mind; there is a spirit abroad, on the earth, in the waters of the great deep, amid the clouds and the air, and throughout the maze of orbs which decorate the heavens, to whose thoughts we are unceasingly present, whose power we cannot resist, whose designs and purposes are ever unfolding themselves to our curiosity and admiration, and from whose benevolence we receive all the blessings of time, and derive all our hopes of a future existence. It is this conviction which ennobles man, and which, in assigning him his true rank in creation, connects him in intellect and feeling with all the other works of the Almighty. Poetry, accordingly, deduces from this source its highest power to animate the mind, and its richest stores of illustration; for the varied personification in which it delights, implies something essentially distinct from gross, inert matter; and, were we to abstract it from the productions of the muse, nothing would remain but a dull chronological record, or a reference to places and circumstances in which there was no living principle to call forth our sympathies. Those who have most successfully cultivated this sublime art are most liberal and most correct in their adoption and application of this emphatic language. The inspired writers, with whom the highest poetic strains are always subservient to the announcement of the divine will, and the communication of some important truth, use it familiarly and seemingly without effort, as if nature by a thousand tongues held communion with them, and disclosed all her mysterious intelligence. To their illuminated minds, we may safely say, "the heavens declared the glory of God," and "the firmament shewed his handy-work; day unto day uttered speech, and night unto night shewed knowledge;" to them, "the earth was full of the goodness of the Lord; the sea roared, and the fulness thereof; the floods clapped their hands before the Lord; the mountains trembled at his presence;" "the little hills rejoiced on every side;" "the pastures shouted for joy;" "the wilderness, and the solitary place was glad; the desert rejoiced, and blossomed as the rose; it blossomed abundantly, and rejoiced even with joy and singing." Such is the striking manner in which they frequently express themselves, and such is the spirit in which the Psalmist, who particularly adopts it, calls on all the objects of creation, animate and inanimate, to acknowledge their great author: "Praise ye him, all his angels: praise ye him, all his hosts. Praise ye him, sun and moon: praise him all ye stars of light. Praise him, ye heavens of heavens, and ye waters that be above the heavens." And the reason which he assigns for this universal call seems to be the supposition of consciousness of their origin and obligation: "Let them praise the name of the Lord; for he commanded, and they were created."—(*Ps.* 148.)

We find examples of this sort of personification, though certainly less energetic and sublime, in the eminent poets both of antiquity and modern times. But, in many of the former, the glory of the Divine Being, as pervading all things, is distributed, so to speak, among the multiplicity of those vanities which constituted the popular superstition; and this prostitution has often been absurdly imitated by their more culpable successors, who, in employing similar language, have merely substituted for the titles of the heathen deities the names of those virtues and excellencies, whether moral or physical, which they themselves happened to think worthy of adoration. Still, the same identical principle is distinctly cognizable in these apparently discordant instances; all nature is made to speak, to utter, as it were, the sentiments and feelings which are peculiar to our own constitution; and the only true reason for it that can be assigned, may be simply expressed in the words of one of the ancients, *Jovis omnia plena*. A recent writer, without tracing them to their source, has enumerated several examples of personification, which it may be worth while to bring before the eye of the reader, who will be at no loss either to add to the list, or to discover and appreciate their true import.

"The poets and sacred writers not unfrequently imagine hills and woods to become vocal, to have sensation, and, participating in the delights they impart, to lift up their voices in praise and gratitude. Thus, vales are said to smile, water to blush, woods to whisper and admire; trees to have ears; ether to laugh; the ocean to smile; mountains to listen and to speak; waterfals to feel the effects of love, &c. &c. These metaphors are perpetual in poetry, and not unfrequent in common conversation. In reference to the imaginary qualities with which we endow the various objects of landscape, the poets occasionally address themselves to those objects, as if they were capable of hearing and obeying the call. Thus, Moschus, in his highly-finished elegy on the death of Bion, calls upon the woods and fountains to mingle their sorrow with his; and Milton, whose subject and whose genius sublimed him beyond the limits of the world, and after whom, as Johnson finely observed of Shakespeare, "Time toiled and panted in vain," has a transcendant passage in the morning hymn sung by our first parents, where they call upon the visible creation to join with them in celebrating their great Father. After invoking the angels of light, the sun, the moon, the stars, the air, and the elements, Adam invites the mists and exhalations, the pines and plants, the winds and fountains, to accompany him in his devotions, and to be witness against him if at any time he should neglect his morning or his evening orisons. In the Song of the Three Children, the Hebrew poet addresses the nights and days, the sun and moon, the winds, dews, and storms, the ice, hail, and snow, the fountains, rivers, and seas, the fowls of the air, and every object in nature, to praise and glorify the hand that made them. Camoens makes the various objects of nature mourn for the death of Alonzo. What can be more elegant than Young's address to the lilies? (*Night Thoughts*, B. III. l. 124.) In Ossian how beautiful,—"Retire, O Sun! the daughter of Colla is asleep. She will not come forth in her beauty: she will not move in the steps of her loveliness." (*Darthula*.) In Isaiah, how sublime,—"Hear, O heaven, and give ear, O earth, for the Lord hath spoken. I have nourished and brought up children, but they have rebelled against me." (Ch. i. v. 2.) The following passage is scarcely unworthy of Isaiah himself:—"The spirit of Loda shrieked; as it rolled into himself, he rose on the wind. Inisterre shook at the sound. The waves heard it on the deep. They stopped in their course with fear." The Welsh poets frequently address Snowdon, as if it were capable of hearing and answering the call. This species of personification is not unfrequent in the sacred writers: "Open thy doors, O Lebanon, that the fire may devour thy cedars. Howl, fir-tree, for the cedar is fallen; because the mighty are spoiled: howl, O ye oaks of Bashan, for the forest of the vintage is come down." (Zechariah, ch. ix. v. 1, 2.) "The mountains saw thee, and they trembled: the overflowing of the water passed by: the deep uttered his voice, and lift up his hands on high," &c. (Habakkuk, ch. iii. v. 10.) Jeremiah has a bold example of this kind: "O thou sword of the Lord, how long will it be ere thou be quiet? Put up thyself into thy scabbard, rest and be still." (Ch. xlvii. v. 6.) And an instance occurs in the second book of Samuel, where David, hearing of the death of Saul and Jonathan, in all the nature, and with all the strength of passion, bursts into imprecation against the mountains of Gilboa. (Ch. i. v. 21.) The practice is extended to every object in landscape. Many instances occur in Euripides; and in Sophocles there is a fine passage in one of his tragedies, where he makes Ajax address himself to the sun, and pray that it may stop in its progress over his native country, in order to relate his misfortunes to his father and mother. Virgil has several beautiful examples; and Cicero a remarkable one, in his treatise on the Nature of the Gods. In the midst of his oration for Milo, he invokes the groves and tumuli of Alba, in a manner which it were impossible not to admire. Dante has an admirable apostrophe to the waterfals of Casentino, (*Inferno*, canto xxx. st. 11.)—and Southern a still finer one to the sun, in his tragedy of *Oroonoko*. Virgil makes the sun mourn for the death of Cæsar, (Geor. i. v. 460.)—and Ovid makes the seventh star of the Pleiades hide itself for shame; (*Fasti*, lib. iv. v. 167.) while, in the legend which records the transportation of the chapel of the Virgin to Loretto, Nature herself is said to have leaped in transport, and the oaks to bow themselves. (*Misson*. Vol. I. 332.) In another example, the polar star is made to hide itself in anger. (*Vossius de Isol.* lib. ii. c. 30.) Tasso (*Jer. Del.* c. vii.) describes Erminia as addressing the trees, as if they were capable of recording her sorrow. Petrarch has an instance, in a sonnet addressed to the scenes of Vaucluse; nor is it possible to observe a more beautiful example than that in Thomson's concluding hymn, or in that where Adam, after the first discovery of his consciousness, addresses the various objects around him, and desires them to inform him whence he derived his existence. (*Paradise Lost*, b. vi.) What an affecting instance, too, is that exhibited in a passage of Sophocles, where Philoctetes, bending with anguish, bursts out,

"O mountains, rocks, and savage herds,
To you I speak! To you alone I now
Must breathe my sorrows! You are wont to hear
My sad complaints; and I will tell you all
That I have suffered from Achilles' son."

Æschylus, also, in his tragedy of Prometheus:

"Ethereal air, and ye swift-winged winds;
Ye rivers, springing from fresh founts; ye waves
That o'er the interminable ocean wreath
Your crisped smiles; thou all producing earth,
And thee, bright sun, I call, whose flaming orb
Views the wide world beneath, see what,—a god,
I suffer from the gods."

A still more affecting instance occurs in Lear, where the unfortunate monarch, in the midst of a violent storm, exclaims,

> " Nor rain, wind, thunder, fire, are my daughters:
> I tax not you, ye elements, with unkindness:
> I never gave you kingdoms; call'd you children:
> You owe me no subscription:—why, then, let fall
> Your horrible pleasure!"

A curious instance of giving to natural objects the feelings of humanity, occurs in Plutarch, where he relates, that, when Parmenio objected to Alexander's passing over the Granicus at a late hour of the day, Alexander replied,—" The Hellespont would blush, if, after having passed it, I should be afraid of the Granicus!" It is not improbable, that the speech of Alexander might have suggested the idea of those elegant Latin lines of Crashaw, whence Dryden borrowed that celebrated line:

> " The conscious water saw its God, and blush'd!"

(*Bucke on the Beauties, Harmonies, and Sublimities of Nature.*—Vol. I.

These examples are evidently chosen without any regard to their bearing on the principle which has been contended for; and, on this account, they may seem to have an isolated or unconnected character. Several of them, it may also be remarked, are trivial in their import, though ascribing something of the nature of living action and feeling, or thought, to material objects,—the kind as well as the degree of this *vitality* and *consciousness*, if it may be permitted to use the expression, being rarely considered as indicative of a constitution beyond what is possessed by beings in almost the very lowest rank of animated nature, and as such deemed little superior to those bodies which, though obviously organized, are not conceived to enjoy sensibility. But, besides that the number of the examples, and they might be easily increased, and their occurrence among writers of very different ages and countries demonstrate the prevalence of the tendency to personify, it will be manifest to the philosophical inquirer, that, unless the phenomena of life can be traced to some of the ascertained properties and laws of matter, which, notwithstanding the strongest wish to succeed in the induction manifested by certain speculatists, they never yet have been, the slightest and lowest peculiarities of the living principle are as cogent as the strongest and most exalted, in evidence of a power all-pervading in operation, and supreme in authority, over the universe. In reality, we cannot contemplate even the smallest indication of life without tacitly admitting the existence of a principle, whatever it may be, the qualities of which are distinct from those of matter, as known to our senses; and it is equally impossible for us, in any way, to state this admission to our understandings as a logical proposition, without having the idea excited of a great First Cause, to which we and all things around us owe our being. The manner in which that idea may operate, or the attributes which may be ascribed to its object, will greatly depend on peculiarities of constitution, and the circumstances in which men are placed, in regard to education, moral and religious institutions and advantages, and the other conditions of society. Hence some of the diversities of sentiment and imagery, and they are among the most remarkable to be found in them, exhibited by the poets, especially those of early date, who seem to have strongly imbibed, as they have faithfully preserved, the prejudices and creeds of their times and countries. Poetry, then, is the grand preserver, if not the expositor, of the language of nature, and consequently is entitled to higher estimation than is generally assigned to it, when its object is imagined to be merely the delight or the recreation of the mind. It is of its very essence to instruct and inform, whatever may be the precise doctrines it inculcates; and this essence is plainly perceptible, even in those descriptions of natural scenery which seem least to admit of the didactic quality. It is with propriety, therefore, that a well known writer, who will be universally allowed to understand and to relish its excellencies, of which he has in his own works displayed so large a portion, has undertaken the defence of poetry against a probably well meant but injudicious objection, and has asserted its title to higher distinction than can be claimed for a source of pleasure merely, however great or refined. In perusing the following quotation, in which this defence is contained, the reader will have only to comprehend religion, as in justice to the writer ought to be comprehended, under the term *morality*, to perceive the entire concurrence of Mr Campbell's sentiments, apparently deduced from a different train of thought, with those which have now occupied our attention. The passage occurs in the biographical notice of Joseph Warton, given in Specimens of the British Poets, Vol. VII.—and, besides its bearing on this point, will be found to touch on a question which has recently agitated the literary world: " It appeared to Dr Warton, that versified observations on familiar life and manners had usurped the honours which were exclusively due to the bold and inventive powers of imagination. He conceived, also, that the charm of description in poetry was not sufficiently appreciated in his own day; not that the age could be said to be without descriptive writers, but because, as he apprehended, the tyranny of Pope's reputation had placed moral and dramatic verse in too pre-eminent a light. He, therefore, strongly urged the principle, " that the most solid observations on life, expressed with the utmost brevity and elegance, are morality, and not poetry." Without examining how far this principle applies exactly to the character of Pope, whom he himself owns not to have been without pathos and imagination, I think his proposition is so worded as to be liable to lead to a most unsound distinction between morality and poetry. If by " the most solid observations on life" are meant only those which relate to its prudential management and plain concerns, it is certainly true that these cannot be made poetical by the utmost brevity or elegance of expression. It is also true, that even the nobler tenets of morality are comparatively less interesting, in an insulated and didactic shape, than when they are blended with strong imitations of life, where passion, character, and situation, bring them deeply home to our attention. Fiction is, on this account, so far the soul of poetry, that, without its aid as a vehicle, poetry can only give us morality in an abstract and (comparatively) uninteresting shape. But why does fiction please us? Surely not because it is false, but because it seems to be true; because it spreads a wider field, and a more brilliant crowd of objects to our moral perception than reality affords. Morality (in a high sense of the term, and not speaking of it as a dry science) is the *essence of poetry*. We fly from the injustice of this world to the poetical justice of fiction, where our sense of right and wrong is either satisfied, or where our sympathy, at least, reposes with less disappointment and distraction than on the characters of life itself. Fiction, we may indeed be told, carries us into "*a world of gayer tinct and grace*," the laws of which are not to be judged by solid observations on the real world. But this is not the case,—for moral truth is still the light of poetry, and fiction is only the refracting atmosphere which diffuses it; and the laws of moral truth are as essential to poetry as those of physical truth (anatomy and optics, for instance) are to painting. Allegory, narration, and the drama, make their last appeal to the ethics of the human heart. It is, therefore, unsafe to draw a marked distinction between morality and poetry, or to speak of "*solid observations on life*," as of things in their nature unpoetical; for we *do* meet in poetry with observations on life, which, for the charm of their solid truth, we should exchange with reluctance for the most ingenious touches of fancy."

Is it not obvious that this flight from the "injustice of the world to the poetical justice of fiction," is an acknowledgment of the superintendence of an invisible power, whose decisions, suspended and lingering as they may seem, are believed and expected to be always according to truth? The ethics of the human heart, our sense of right and wrong, the moral principle, as some writers have denominated it, or, in the language of the phrenologists, our sentiment of conscientiousness, which is, strictly speaking, natural and constitutional, and by no means the result of education or prejudice, however it may be influenced by them, cannot be satisfied but by such an appeal and such a conviction; and there is unquestionably a relief obtained to our feelings, when hurt by the doubtful events passing around us, in the certainty that our moral conclusions, though discountenanced and outraged by appearances, are in strict accordance with the laws of that great Being who governs the world, and will be ultimately ratified by him. Perhaps Juvenal is to be thus understood, when he says, "Si natura negat, facit indignatio versum." It is, therefore, most correctly and most expressively said by Mr Campbell, that "moral truth is the light of poetry;" and it may be added, that, for its due efficacy in a work of fiction, the poet who would employ it must avail himself largely of this ideal language,—for, to quote a highly appropriate passage from a recent dramatic poem, of no ordinary merit, (*Julian the Apostate*,)

"All natural objects have
An echo in the heart. This flesh does thrill
And has connection by some unseen chain
With its original source and kindred substance.
The mighty forest, the proud tides of ocean,
Sky-cleaving hills, and, in the vast of air,
The starry constellations; and the sun,
Parent of life exhaustless—these maintain
With the mysterious mind and breathing mould
A co-existence and community."

There is probably no more needed to demonstrate the origin and the real import of the language of nature, than to notice the correspondence between it and a train of emotions to which there has hitherto been no distinct allusion. They are comprehended, indeed, in the general idea of poetic justice; but most of the examples which have been quoted, and the reflections to which they have led, have either partaken more of the nature of hope than of fear, or been built on a pleasing and consolatory view of the moral government of the world. There is another aspect in which that government must be contemplated; and there are numerous instances to be found, in poetic and other writings, of the cogency of the language by which it is suggested, or which spontaneously flows from it. The history of superstition, in all its variety of horrors and absurdities, and the long catalogue of distressing apprehensions which so often beset the minds of mankind, as to whatever is uncommon and unaccountable in nature, furnish ample proof of its universality and energy. Hume was so sensible of this point, that he partly founded on it his opinion of the origin and prevalence of religion among mankind, and to a certain extent his observations are correct. The error which he committed here lay in his limitation of the principle, and the inferences he deduces, or wished to deduce from it, not in assuming, as the basis of his reasoning, something which does not exist, or which cannot be reconciled with the constitution of the human mind. In the following passage, for example, taken from his essay "Of Superstition and Enthusiasm," he is to be blamed, not for going too far in assigning the causes of the former, which he imputes apparently to external agents and accidental circumstances, but for not going far enough, in adding to them, and regarding as its most fruitful source, an internal, contitutional principle, without which the rest, great and momentous as they seem, would be of small consequence in the production of misery. "The mind of man is subject to certain unaccountable terrors and apprehensions, proceeding either from the unhappy situation of private or public affairs, from ill health, from a gloomy and melancholy disposition, or from the concurrence of all these circumstances. In such a state of mind, infinite unknown evils are dreaded from unknown agents; and where real objects of terror are wanting, the soul, active to its own prejudice, and fostering its predominant inclination, finds imaginary ones, to whose power and malevolence it sets no limits. As these enemies are entirely invisible and unknown, the methods taken to appease them are equally unaccountable; and consist in ceremonies, observances, mortifications, sacrifices, presents, or in any practice, however absurd or frivolous, which either folly or knavery recommends to a blind and terrified credulity. Weakness, fear, melancholy, together with ignorance, are therefore the true sources of superstition." Again, in his treatise on the Natural History of Religion, distinguishing between the foundation of religion in *reason,* which he unequivocally asserts to lead to "the primary principles of genuine theism," and its "origin in *human nature,*" as explained by him in the course of his observations, and which he thinks to have as certainly led to polytheism, he writes to this effect. "In all nations which have embraced polytheism, the first ideas of religion arose, not from a contemplation of the works of nature, but from a concern with regard to the events of life, and from the incessant hopes and fears which actuate the human mind. It must necessarily, indeed, be allowed, that, in order to carry men's attention beyond the present course of things, or lead them into any inference concerning invisible intelligent power, they must be actuated by some passion which prompts their thought and reflection,—some motive which urges their first enquiry. But what passion shall we here have recourse to, for explaining an effect of such mighty consequence? Not speculative curiosity, surely, or the pure love of truth. That motive is too refined for such gross apprehensions, and would lead men into enquiries concerning the frame of nature, a subject too large and comprehensive for their narrow capacities. No passions, therefore, can be supposed to work upon such barbarians but the ordinary affections of human life; the anxious concern for happiness, the dread of future misery, the terror of death, the thirst of revenge, the appetite for food and other necessaries. Agitated by hopes and fears of this nature, especially the latter, men scrutinize, with a trembling curiosity, the course of future causes, and examine the various and contrary events of human life. And in this disordered scene, with eyes still more disordered and astonished, they see the first obscure traces of divinity.—We are placed in this world as in a great theatre, where the true springs and causes of every event are entirely concealed from us; nor have we either sufficient wisdom to foresee, or power to prevent, those ills with which we are continually threatened. We hang in perpetual suspense between life and death, health and sickness, plenty and want, which are distributed amongst the human species by secret and unknown causes, whose operation is oft unexpected, and always unaccountable. These *unknown causes,* then, become the constant objects of our hope and fear; and while the passions are kept in perpetual alarm by an anxious expectation of the events, the imagination is equally employed in forming ideas of those powers on which we have so entire a dependence."

This singular man was evidently much puzzled to account for the phenomena which he undertook to explain, but, with all his real or affected scepticism, felt constrained to admit the existence and the predominance of *something* in human nature—in *human nature* be it carefully observed,—on which both the idea of invisible power and the poetical practice connected with it were founded. That he is not explicit in his mode of speaking of it, is of comparatively little moment, seeing that the admission he makes is quite sufficient as to its reality. "There is an universal tendency among mankind to conceive all beings like themselves, and to transfer to every object those qualities with which they are familiarly acquainted, and of which they are intimately conscious. We find human faces in the moon, armies in the clouds; and by a natural propensity, if not corrected by experience and reflection, ascribe malice or good-will to every thing that hurts or pleases us. Hence the frequency and beauty of the *prosopopoeia* in poetry; where trees, mountains, and streams are personified, and the inanimate parts of nature acquire sentiment and passion. And though these poetical figures and expressions gain not on the belief, they may serve, at least, to prove a *certain tendency in the imagination, without which they could neither be beautiful nor natural.* Nay, philosophers cannot entirely exempt themselves from this *natural frailty*; but have oft ascribed to inanimate matter the horror of a vacuum, sympathies, antipathies, and other affections of human nature." And to this must be added the following remarks, which, mortifying as they may be to human pride, have too much truth in them to be slightly regarded. They are quite relevant to the present topic. "Any of the human affections may lead us into the notion of invisible, intelligent power; hope as well as fear, gratitude as well as affection: But if we examine our own hearts, or observe what passes around us, we shall find that men are much oftener thrown on their knees by the melancholy than by the agreeable passions. Prosperity is easily received as our due, and few questions are asked concerning its cause or author. It begets cheerfulness, and activity, and alacrity, and a lively enjoyment of every social and sensual pleasure; and, during this state of mind, men have little leisure or inclination to think of the unknown invisible regions. On the other hand, every disastrous accident alarms us, and sets us on inquiries concerning the principles whence it arose; apprehensions spring up with regard to futurity, and the mind, sunk into diffidence, terror, and melancholy, has recourse to every method of appeasing those secret intelligent powers on whom our fortune is supposed entirely to depend."

But of all the melancholy passions, to use the rather incorrect expression of Mr Hume, the most overwhelming in itself, and that which serves most effectually to give poignancy and acuteness to "disastrous accidents," is the consciousness of guilt arising from the violation of some moral law, and the attendant foreboding of retributive justice. To this feeling, little regarded by Mr Hume, but not denied by him, creation addresses itself with an energy not to be resisted, and in a strain which admits no admixture. Its remedy is not in nature. To it, when fully roused, the beauties of the external world present no charms, or, by contrast, become positive annoyances; and every event of a painful or distressing kind assumes an aspect more than usually terrific and offensive. Prosperity no longer delights. It is rather a reproach. Misfortune and affliction are the only fitting visitors; but though, by their suitableness, they may concur

Natural Language.

alike with the dictates of the understanding and the feelings of the heart, they are, besides their direct effect, too much akin to the anticipations of the mind to allow any rest to the sufferer. Poetry, accordingly, has nothing, in its catalogue of instruction and interest, more impressive and authoritative than its delineations of the horrors of this condition; and in none of its efforts is it more aided by prosopopœia, or the adoption of the supposed language of nature. The conduct of Macbeth, and the distress of his wife, after the murder of their king, as pourtrayed by our great dramatist, are most striking examples familiar to every reader. But in alluding to this, or to the subject at large, it is not intended to be maintained that the commission of great crimes is essential to the feeling, or that the feeling displays itself on such extraordinary occasions only. All that is contended for is, the peculiar susceptibility of the mind, arising from the sense of demerit, however small that may be, and a corresponding tendency to conceive brute and insentient objects endowed with animation and consciousness. The history of murderers amply proves the propriety of Macbeth's reference to popular belief, and the cogency of the reasons on which that belief is founded:

"They say, blood will have blood;
Stones have been known to move, and trees to speak;
Augurs, and understood relations, have
By maggot-pies, and choughs, and rooks, brought forth
The secret'st man of blood."

Not, by any means, that these have actually assumed the office of prosecutor, or have borne audible testimony to the deed. It is, that the mind, under the influence of remorse, has endowed them for the time with its own intelligence, and imparted to them its own power to upbraid and torture. Now, though the degree may be different, the affection or passion is the same, which, after any trespass, or even the forethought and purpose of a crime that may never be committed, produces dissatisfaction with oneself, and excites a fear of external nature. Juvenal has admirably described it in his 13th satire. From his comment on the story, taken from Herodotus, which he introduces to illustrate it, Mr Gifford imagines him to have availed himself of a ray of that "true light" which then began to glimmer through the world. But it is not necessary to subscribe to this opinion—and indeed a very weighty objection might be stated against it—in order to perceive the moral force of the picture:

"But why are those, Calvinus, thought to 'scape
Unpunish'd, whom, in every fearful shape,
Guilt still pursues, and conscience, ne'er asleep,
Wounds with incessant strokes, 'not loud but deep;'
While the vex'd mind, her own tormentor, plies
A scorpion scourge, unmark'd by human eyes!
Trust me, no tortures which the poets feign,
Can match the fierce, the unutterable pain
He feels, who night and day, devoid of rest,
Carries his own accuser in his breast.
A Spartan once the oracle besought,
To solve a scruple which perplex'd his thought,
And plainly tell him, if he might forswear
A purse, of old, confided to his care.
Shuddering, the priestess answered, 'Waverer, no!
Nor shalt thou for the doubt unpunish'd go.'
With that he hasten'd to restore the trust;
But fear alone, not virtue, made him just:
Hence he soon proved the oracle divine,
And all the answer worthy of the shrine;
For plagues pursued his race without delay,
And swept them from the earth, like dust, away.
By such dire sufferings did the wretch atone
The crime of meditated fraud alone!
For, IN THE EYE OF HEAVEN, a wicked deed
Devis'd, is done: what, then, if he proceed?
Perpetual fears the offender's peace destroy,
And rob the social hour of all its joy:

* * * * *

At night, should sleep his harass'd limbs compose,
And steal him, one short moment, from his woes,
Then dreams invade: sudden, before his eyes,
The violated fane and altar rise;
And (what disturbs him most) your injur'd shade,
In more than mortal majesty array'd,
Frowns on the wretch, alarms his treacherous rest,
And wrings the dreadful secret from his breast.
These, these are they, who tremble and turn pale,
At the first mutterings of the hollow gale!
Who sink with terror at the transient glare
Of meteors, glancing through the turbid air!
Oh, 'tis not chance, they cry; this hideous crash
Is not the war of winds, nor this dread flash
The encounter of dark clouds, but blasting fire,
Charged with the wrath of heaven's insulted ire!
This peal, at a safe distance, dies away;
Shuddering, they wait the next with more dismay;
As if the short reprieve were only sent,
To add new horrors to their punishment."—&c.

Juvenal was well aware of the source whence such apprehensions arose.

"With what a rapid change of fancy roll
The varying passions of the guilty soul!
Bold to offend, they scarce commit the offence,
Ere the mind labours with an innate sense
Of right and wrong:"—

Or, as at the commencement of the same satire,

"Man, wretched man, whene'er he stops to sin,
Feels, with the act, a strong remorse within;
'Tis the first vengeance:—Conscience tries the cause,
And vindicates the violated laws."

And the correspondence between this innate sense and the language of nature, thus interpreted by it, is fairly asserted in the conclusion, where, having foretold the punishment that awaited his false friend, he thus exhorts Calvinus:

"THIS THOU SHALT SEE; and, while thy voice applauds
The dreadful justice of the offended gods,
Reform thy creed, and, with an humbled mind,
Confess that Heaven is NEITHER DEAF NOR BLIND!"

The language of the satirist in this excellent production is very like that of Job's friends, when dealing out reproof, and insisting on the justice of God.—Witness what Zophar says, " Knowest thou not this of old, since man was placed upon earth, that the triumphing of the wicked is short, the joy of the hypocrite but for a moment? Though his excellency mount up to the heavens, and his head reach unto the clouds; yet he shall perish for ever, like his own dung; they which have seen him shall say, where is he? He shall fly away as a dream, and shall not be found; yea, he shall be chased away as a vision of the night. His bones are full of the sin of his youth, which shall lie down with him in the dust. Though wickedness be sweet in his mouth; though he hide it under his tongue; though he spare it and forsake it not, but keep it still within his mouth; yet his meat in his bowels is turned, it is the gall of asps within him.—When he is about to fill his belly, God shall cast the fury of his wrath upon him, and shall rain it upon him when he is eating."

" Perpetua anxietas nec mensæ tempore cessat,
Faucibus ut morbo siccis, interque molareis
Difficili crescente cibo; sed vina misellus
Exspuit: Albani veteris preciosa senectus
Displicet,"—&c.

" The heaven shall reveal his iniquity, and the earth shall rise up against him. The increase of his house shall depart, and his goods shall flow away in the day of his wrath. This is the portion of a wicked man from God, and the heritage appointed unto him by God," (Chap. 20.) Job, much as he resisted the application of such doctrine to his own case, concurs in its truth.—" This is the portion of a wicked man with God, and the heritage of oppressors," &c.—" Terrors take hold on him as waters, a tempest stealeth him away in the night. The east wind carrieth him away, and he departeth; and as a storm hurleth him out of his place. For God shall cast upon him, and not spare," &c.—(Chap. 27.)

Well does the king in Hamlet say, when reflecting on the horrid deed which conducted him to a throne, but allowed him no peace to enjoy it:

" In the corrupted currents of this world,
Offence's gilded hand may shove by justice;
And oft 'tis seen the wicked prize itself
Buys out the law: But 'tis not so above:
There is no shuffling there,—the action lies
In his true nature; and we ourselves compelled,
Even to the teeth and forehead of our faults,
To give in evidence."

And, accordingly, to quote Hamlet,—

" Thus conscience does make cowards of us all,
And thus the native hue of resolution
Is sicklied o'er with the pale cast of thought;
And enterprises of great pith and moment,
With this regard, their currents turn awry,
And lose the name of action."

So Job himself, " a perfect and an upright man" as he was called, whose labours at self justification gave so much trouble to his friends, and who had determined to " maintain his integrity" while he lived, is no sooner addressed by the Almighty " out of the whirlwind," and taught the extent of divine power and authority, than he is made to exclaim, in the language of the human heart, when confronted with the holiness of God: " I know that thou canst do every thing, and that no thought can be withholden from thee. I have heard of thee by the hearing of the ear: but now mine eye seeth thee. Wherefore I abhor myself, and repent in dust and ashes."

There is reason to believe, that all the propensities, sentiments, and faculties of man, are capable, when fully excited, of producing something like a belief or persuasion of conscious existence and intelligence in surrounding objects. Hence, probably, we may deduce the variety of metaphorical illusion in poetry; and hence, too, with equal probability, much of the mythology of the ancients, with which we know their poetry was intimately connected. To this cause, operating most strongly, of course, in those states of society which approached nearest to the condition of nature, may be ascribed the palpable genuineness of feeling and force of expression found in the earliest poetry of nations; as to the gradual abatement of its influence, consequent on the increase of science, and, still more, the introduction of any true light on the subject of religion, we may look for an explanation of a fact in the progress of the art, which is not otherwise easily to be understood, the decline of strength, or, in other words, the essence of poetry, while there is presented an evident improvement in the medium by which it was conveyed. Vigour and simplicity of thought seem generally to have given way to correctness and purity of expression, in the history of most people; till the possession of divine truth, regarding the creation and government of the world and the destiny of our species, by exalting the conceptions and the aims of those who cultivated poetry, not as an art merely, or on its own account, but as a means of rousing the feelings of their fellow-creatures, at once vindicated its origin and directed its efforts. When popular opinion was rectified, the province of fiction became limited; but its inhabitants acquired a distinctness and a verisimilitude of character, which, in their power of exciting sympathy, amply compensated for the loss of what was wonderful in the former creations of the muse. The scenes described and the actions narrated must now be world-like and probable; and even the ideal beings which the caprice of fancy or the love of novelty might occasionally produce, must partake of the human constitution, like Shakspeare's Caliban, or have familiar intercourse with our species, like the sprites of his Midsummer Night's Dream. But such beings are of very hazardous formation, in an age and country, where superstition, utterly driven from her " palmy state," can hardly find an asylum in the cottages of the poor; and perhaps they would scarcely be attempted by another Shakspeare, if another were to arise among us. Ghosts, fairies, and other aerial creatures, can scarcely find a place now in any sort of fictitious composition. The author of Waverley, indeed, has recently presumed to make the experiment, in one of his tales, the Monastery; but not with a success calculated to induce a repetition, at least from his hands. Mr Southey, undoubtedly a man of genius, has gone much farther into the regions of the improbable, and endeavoured to embody the monstrous conceptions of the East in verse. But the "Curse of Kehama" will remain a proof of his inconsideration and hardihood, in neglecting or resisting the spirit and disposition of his day; while the splendour of its imagery, and the beauty of its diction, must excite regret that he should have sacrificed talents and labour to a most unpropitious deity.

Some questions, either necessarily arising out of the preceding reflections on the language of nature, or intimately connected with them, as bearing on the origin, the progress, and the constitution of poetry, considered as distinct from versification, which is merely a mechanical arrangement of arbitrary language, and therefore belongs to another division of the subject, now offer themselves for discussion. They chiefly relate to what has been denominated *poetic licence*,—a topic which has agitated philosophical critics from a very early period to the present time. What is hazarded here in its elucidation must be brief, and, as much as possible, divested of technical phraseology. Those who wish for farther information regarding it, will do well to consult an ingenious essay published several years ago by Mr Vigors, with several of the opinions of which the remarks proposed to be delivered will be found to agree.

Poets have, in all ages, been indulged with certain liberties of composition which are denied to the historical writer; and these liberties seem to have been both claimed and granted on the same ground, namely, the opinions generally entertained of the nature and origin of the art which they exercised. It has been allowed them to seek for embellishments beyond the regions of actual existence, out of the sphere of natural events or facts ascertained by experience and observation; in short, to take every means of delighting or interesting the mind which the vivacity and richness of their own fancies could supply. The very name which is given to it implies the power of *creating*; and the higher specimens of the art, those which exhibited most of that power, were universally ascribed by the ancients to a greater agency than the mere intelligence of man. They were deemed the inspirations of a supernatural power, the effects of what may be called a *divine phrenzy*. We say divine phrenzy on the authority of no less a writer than Plato, whose words on the subject of poets are curiously expressive:—"God, having taken away their understanding, employs them as his servants, &c.; so that we who hear them may know, that it is not they themselves, *who have not their senses*, that speak such things, &c., but that it is *God himself* who speaks and utters sounds, (alluding probably to the chaunting manner of the bards) to us, by them." Plato (περι Ιλιαδ:) The poets themselves might be quoted for similar evidence, as every scholar knows that their writings abound in similar assertions. This language of the ancients respecting poetic enthusiasm, it may be remarked, savours much of intentional exaggeration, resulting probably from a desire to dignify the origin and nature, and perhaps to magnify the power of an art which they observed greatly to influence the natural feelings of mankind; or perhaps it may be still more correct, and nearer the truth, to suppose, that as poetry was first of all principally used in the offices and administration of religion, the language of those ancient writers, whether philosophers, historians, or poets, who have recorded its effects, has been proportioned to their high conceptions of its importance. The connexion between religious feelings and allegorical expressions, the allowed language of poetry as already mentioned, may be distinctly traced in the histories of almost every people; and in consistency with the fact of this alliance, we may observe, as a remarkable circumstance, that as the heathen mythology, by inculcating the specific inspiration of its votaries, and by fostering the love of the marvellous, so natural to our species, and so prevalent in rude ages, was favourable to the enthusiasm and the success of the poet,—so, since the supplanting of that mythology by the principles of a purer faith, few specimens of genuine poetry have been the offspring of *sceptical minds*. For proofs of this connexion, it is enough to refer either to the biographical accounts and brief notices handed down to us of the earliest poets, or to such of their writings as have escaped the ravages of time. Pausanias tells us, that Anthes, the Bœotian, celebrated the gods in his hymns. Homer is thought by some to have copied the hymn to Jupiter from one on the same subject by Pampho of Attica, the disciple of Linus, who himself wrote concerning the creation of the world, according to the testimonies of Diodorus Siculus and Laertius.

Virgil, in the 6th Eneid, makes an address to Musæus, the son or pupil of Orpheus, as the "*Optime vates*," using a term which comprehends both poet and prophet; and Heyne very properly remarks on the passage, "Magna Musaei auctoritas propter religiones et teletas institutas." In fact, the theogonies and sacred hymns of the ancients were scarcely less numerous than the names of their poets. Herodotus says, indeed, that Hesiod and Homer were the first who used theogonies among the Grecians; but there is undoubted authority for charging that historian with inaccuracy in the assertion. As to later poets among the Grecians, we have abundant proof of the strong religious feeling and sentiment which animated their compositions. A few instances may be specified. The Γνωμαι of Theognis are full of moral and religious reflections, which deserve the commendation of Harwood: "His ethical admonitions are just and useful, and will ever be read with pleasure and improvement." Pindar's hymns to the gods are lost; but what remains of his poetry shews uncommon religious enthusiasm, and we are told that he was in favour with some of their divinities. It may be worth while to mention that very curious piece of Lycophron, *Cassandra*, or *Alexandra*, the only part of his works extant, since the appearance of the excellent edition of which by Dr Potter, in the beginning of the last century, the credit of Lycophron, as a poet, has been on the increase. He was blamed for his obscurity and mysteriousness; but is thus defended by Harwood: "In pourtraying the image of common madness, it is enough to be decently absurd. But when the *phrenzy* is supposed to be *divine*, and the fit to proceed from a miraculous transport, (as in the case of the unfortunate Cassandra) then there must be a dark consistency of speech as well as an apparent distraction. There must be the obscure certainty as well as the open phrenzy of an oracle. And what could better answer such a project than to join, in one wild discourse, almost all the terms, and almost all the adventures, of the most copious language, and of the most copious history in the world. If we add to this, the liveliness of the transporting passion, and the artificial strangeness of the digressions, it will not be honour enough to characterize this piece as the best epitome of the Grecian tongue, and of the Grecian fables," &c.

The Romans may be said to have copied from the Grecians in this particular, as in almost every other. We find, accordingly, that, with the exception of Lucretius, their principal poets abound in sentiments and maxims drawn from a religious source, and directed very generally to some purpose of a religious nature. They had their songs of triumph as early as the time of Romulus. Ovid, (*Metam. XV.* 482.) speaks of Numa as,

" Conjuge qui felix Nymphâ, ducibusque camoenis,
Sacrificos docuit ritus; gentemque feroci
Assuetam bello pacis traduxit ad artes;"

And what Horace, (*Ep.* I. i. 86.) calls *carmen Saliare*, a species of prayer, sung in the processions of the priests of Mars, was probably composed by that devout chief. The same writer, lauding the virtues and the efficacy of his art, and claiming for it a high origin says, (*Ep.* II. i. 132.)

" Castis cum pueris ignara puella mariti
Disceret unde preces, vatem ni musa dedisset?
Poscit opem chorus, et praesentia numina sentit;
Coelestes imploret aquas doctâ prece blandus;
Avertit morbos, metuenda pericula pellit;
Impetrat et pacem, et locupletem frugibus annum,
Carmine Di superi placantur, carmine Manes."

So that it seems the very prayers of the Romans, even in the time of Horace, assumed the garb of poetry; and it is known, that, at the same period, the compositions of their prophetic or sacred authors, who generally delivered themselves in verse, amounted to many hundred volumes. Nor ought it to be forgotten, that their stage-plays, in which much of their art was occupied, formed part of their public devotions.

Into the history of the gradations of poetry through all the varied purposes and forms to which it was subjected, this is not the proper place to enter; but a few additional remarks may point out its probable origin and diversities, and prove the correctness of Dryden's opinion, that even the rudest of mankind have the seeds of it implanted in their nature.

Vossius (*De Hist. Græc.* lib i.) asserts, what there is every reason to believe, that the Greek historians and philosophers were subsequent to the poets:— " Sanè historicos et philosophos posteriores esse poetis;" and he refers to Strabo, (lib. v.) for authority. With this agrees Gale, the author of the Court of the Gentiles, as quoted by Sir Thomas Blount: " It is evident from the thing itself, that all the ancient learning of the Grecians, both history, morality, philosophy, and theologie, was delivered in poetry. Hence Orpheus and other poets were anciently styled *Διδάσκαλοι*, *teachers*, because they taught men theologie and morality, &c. Whence also the ancient discourses of the philosophers were styled' *Ασματα*, *songs*, because they delivered their precepts of philosophy in verse. So Pythagoras and the rest of the philosophers of his sect; yea, among the Latins, *carmina*, were used for moral precepts." Here it may be remarked, that the word *carmen*, so frequently applied among the Roman authors to the productions of a prophet or poet, was used to designate any thing expressed in what is understood to be a poetic style, though by no means necessarily in verse. To this effect writes Tindal, in his *Polymetis Abridged*:—" perhaps the solemn forms, prophecies, and charms, were all at first written in verse, and thence the terms *carmen, cantare, decantare*, might be used even when they were in prose." Gale farther notices it, as the general opinion of the learned, that poetry was the most ancient of all artificial literature, especially among the Greeks; and Sir William Temple, to the same purport, writes still more fully, in several passages, which it will be quite enough to abridge, in place of making farther references, to confirm what has been said. The names given to poets, both in Greek and Latin, imply the same opinion concerning them, the Greek word, as already mentioned, signifying a maker or creator, and the Latin word being applied in common to poets and prophets: " Now, as creation is the first attribute and operation of Divine power, so is prophecy the greatest emanation of Divine Spirit in the world." According to the names thus given in these two languages, so are the causes of poetry alleged, by different writers in them, to be divine,—" to proceed from a celestial fire, or divine inspiration;" and, in consistency with this notion, we find it to have been a prevalent notion, that the effect or influence of poetry was supernatural.

" Carmina vel cælo possunt deducere lunam,
Carminibus Circe socios mutavit Ulyssis,
Frigidus in pratis cantando rumpitur anguis."

Temple is careful, however, to moderate the pretensions of poetry either as to origin or influence, and to account for both on natural principles: " I can easily admire poetry," says he; " and yet without adoring it. I can allow it to arise from the greatest excellency of natural temper,—or the greatest race of native genius, without exceeding the reach of what is human, or giving it any approaches of divinity, which is, I doubt, debased or dishonoured, by ascribing to it any thing that is in the compass of our action, or even comprehension, unless it be raised by an immediate influence from itself. I cannot allow poetry to be more divine in its effects than its causes, nor any operation produced by it to be more than purely natural, or to deserve any other sort of wonder than those of music or of natural magic, however any of them have appeared to minds little versed in the speculations of nature, of occult qualities, and the force of numbers or of sounds." This qualification is undoubtedly most judicious; but it is so far from being inconsistent with the theoretical view now contended for, that it alludes to the *constitutional peculiarities* from which poetry is conceived to be derived; and the baronet's subsequent reflections on the subject remove all possibility of doubt as to his sentiments on the subject. "The more true and natural source of poetry may be discovered, by observing to what god this inspiration was ascribed by the ancients, which was Apollo, or the sun, esteemed among them the god of learning in general, but more particularly of music and of poetry. The mystery of this fable means, I suppose, that a certain noble and vital heat of temper, but especially of the brain, is the true spring of these two parts or sciences. This was that celestial fire which gave such a pleasing emotion to the minds of those men, that have been so much admired in the world,—that raises such infinite images of things so agreeable and delightful to mankind: by the influence of this sun, are produced those golden and inexhausted mines of invention, which has furnished the world with treasures so highly esteemed, and so universally known and used in all the regions that have yet been discovered. From this arises that devotion of genius which can never be produced by any art or study,—by pains or by industry;—which cannot be taught by precepts or examples; and therefore is agreed, by all, to be the pure and free gift of heaven or of nature, and to be a fire kindled out of some hidden spark of the very first conception." As to its antiquity, therefore, it might be expected that Temple would concur with those authors who discover it in the very earliest periods of cultivated intellect. The following enumeration of some of the evidence on this point is taken from him, with a few occasional changes.

Poetry is generally agreed to have been the first sort of writing used in the world, and in several nations to have *preceded the very invention or usage of letters*. This is certain as to America, where the first Spaniards met with many strains of poetry, and left several of them translated into their language, which "flowed from a true poetic vein before any letters were known in those regions." The same may be asserted of the Scythians, the Grecians, and the Germans. Aristotle says, that all laws of the Agathyrsi were in verse; Tacitus, that the annals of the Germans were in the same; and as to the Grecian oracles, there is reason to believe that they began before the introduction of letters from Phœnicia. Pliny speaks of it as a thing known, "that Pherecides, who lived about the time of Cyrus, was the first that wrote prose in the Greek tongue; whereas, Homer and Hesiod lived some hundreds of years earlier, as they again were preceded for some hundreds by Orpheus, Linus, and Musæus; and of the Sybils, several were before any of those, and in times as well as places whereof we have no clear records." Solon, as well as Pythagoras, are said to have written in verse; and before them were Archilochus, Simonides, Tyrtæus, Sappho, Stesichorus, and other poets. "The same thing is reported of Chaldæa, Syria, and China. Among the ancient Western Goths, (our ancestors,) the Runic poetry seems to have been as old as their letters and their laws; their principles of wisdom as well as their records, their religious rites as well as their charms and incantations, to have been all in verse." "If we take the book of Moses to be the most ancient in the Hebrew tongue, yet the song of Moses may probably have been written before the rest; as that of Deborah before the book of Judges,—being praises sung to God upon the victories or successes of the Israelites, related in both; and I never read the last without observing in it as true and noble strains of poetry and picture, as in any other language whatsoever." "From all sides, both sacred and profane, it appears that poetry was the first sort of writing known and used in the several nations of the world." He then assigns a reason for what at first sight appears not a little strange, namely, that a sort of style, so regular and so difficult, grew up before another, "so easy and so loose;" and this, though rather misplaced, it may be worth while stating here, in support of former observations. "The true and general end of writing was but the help of memory, in preserving that of words and of actions, which would otherwise have been lost, and soon vanish away, with the transitory passage of human breath and life. Before the discourses and disputes of philosophers began to busy or amuse the Grecian wits, there was nothing written in prose but either laws, some short sayings of wise men, or some riddles, parables, or fables, wherein were couched by the ancients many strains of natural and moral wisdom and knowledge, and, besides these, some short memorials of persons, actions, and of times. Now, it is obvious enough to conceive, how much easier all such writings should be learned and remembered in verse than in prose, not only by the pleasure of measures and of sounds, which give a great impression to memory, but by the order of feet, which makes a great facility of tracing one word after another, by knowing what sort of foot or quantity must necessarily have preceded or followed the words we retain and desire to make up. This made poetry so necessary before letters were invented, and so convenient afterwards; and shews, that the great honour and general request, wherein it has always been, has not proceeded only from the pleasure, but likewise from the usefulness and profit of poetical writings." We shall have occasion afterwards to show, that this is only a partial theory, founded on the mere mechanism of verse, which is by no means essential to poetry, and which probably did not form any part of its constitution in the most early times. The theory is nevertheless of some force, as applied to several productions of the ancients; and there is every reason to believe, that Sir William Temple was ignorant of the precise nature of the Hebrew poetry, certainly among the oldest as well as the best in the world, in which, decisive as its character is, and powerful the truths and arguments it conveys, the labours of many learned and ingenious men have failed to discover any thing resembling the artificial composition of Greek or Roman verse. But to return from this digression.

On the revival of learning in Italy, we may discover an equal prevalence of religious sentiments and enthusiasm in the writings of the poets. Ariosto, the favourite of the Italians, and, we may add, of the English in the days of Elizabeth, as witness the partiality of Spenser, is remarkable for it. No less so, though with greater method and regularity, is Tasso, who founds his great work on a religious subject; and, to come home, we may mention the *Faerie Queen* itself, which entitles Spenser to the name of a moral and religious poet. Thus Gabriel Harvey, under the title of Hobynoll, addresses him on this work:

> " Collyn, I see, by thy new taken taske,
> Some *sacred fury* hath enricht thy braines,
> That leades thy muse, in haughty verse to maske,
> And loath the layes that 'longs to lowly swaynes,"
> &c.

Of Cowley and Milton, it is unnecessary to say a word. The case of Dryden, who has been thought a sceptic, may be considered as an exception; but this is quite a mistake. Dryden, it is true, often abused the clergy, which may have given rise to the opinion of his infidelity; as Dante was, after his death, condemned as a heretic, because he had written a book to shew that the civil government had no dependance on the church! But, of Dryden, it may be enough to say in the words of Dr Johnson, when speaking on this subject, and on the licentiousness of his works, " There is no reason for supposing that he disbelieved the religion which he disobeyed. He forgot his duty rather than disowned it. His tendency to profaneness is the effect of levity, negligence, and loose conversation, with a desire of accommodating himself to the corruption of the times, by venturing to be wicked as far as he durst. When he professed himself a convert to Popery, (in the faith of which he died,) he did not pretend to have received any new conviction of the fundamental doctrines of Christianity." Of the character of Addison, as a teacher of wisdom and religion, the critic speaks still more highly: " All the enchantment of fancy, and all the cogency of argument, are employed by him to recommend to the reader his real interest, the care of pleasing the author of his being." Of Pope, it is sufficient to observe, that, in place of scepticism, he was singular for his attachment to the church of Rome. It might be thought indelicate, as it is unnecessary, to descend to the poets of our own times; but in reference to one individual, whose brilliant career may be alleged as an exception, it will be permitted to hazard the opinion, that the affectation of a Byron *cannot* conceal the real dread of those things against which, with the malignity and the desperation of a demon, he holds it to be his privilege to vent the bitterest railings. This opposition to divine truth does not arise from dissatisfaction with its evidence, but from hatred of its nature; and it requires little knowledge of the human heart to perceive, that this may prove a source of the most impressive, though at the same time the most appalling poetry. One of his lordship's critics has ably pointed out this peculiarity; and the passage in which the animadversion occurs merits quotation for another reason than its concurrence in the sentiment now expressed,—the energy of its language.

" One unhappy characteristic of the mind of Byron, however, too conspicuous in the greater part of his poetry, is that dark and dreary scepticism which has been observed and lamented by all classes of critics. It is not merely that his doubting soul is painfully suspended betwixt the hope of future existence and the dread of annihilation, but that, with an apparently fixed disbelief of futurity, he seems to mingle the most bitter scorn of all its bright promises. He is not a spirit agitated with doubts, and breathing out its sadness in low and melancholy murmurs. The sentiment of infidelity is, in the mind of the poet, not diffident and quiescent, but fiercely and vindictively active,—not a dreary shadow oppressing and darkening the intellect, but a foul and pregnant cloud to which the spark of passion is unceasingly applied. It is not the dream of a speculative intellect, prisoned in the toils wrought by its own fitful activity, and struggling for liberty and life in the grasp of the subtle enchantment; but the dark and troubled movement of a wayward imagination, grappling in proud defiance with the terrors of that eternity which it dare not meet in the sobriety of reason. This attitude of defiance and contempt is not the natural one of calm and assured scepticism; there lurks a thick drop of believing terror in the inmost recesses of that bosom which discharges the poison of its contumely against the awful truths of religion. It is the dead weight of perverted passion alone that could have degraded the mounting spirit of Byron into the scorner of the lofty destiny of his nature; and his upward energy, suppressed but unextinguished, yet heaves and palpitates beneath the incumbent load. The scepticism of Byron is not like the philosophic wandering of Lucretius, through the dark regions of speculation, where the bewildered spirit clasps some disordered phantom, sprung from its own chaotic agitations, as the creative and upholding power of universal nature. The spirit of the modern poet does not pretend to have contemplated, or even attempted, the giddy round of philosophical speculation, returning from the cheerless voyage with the usual freight of fictions and absurdities. The infidelity of Byron is a very repulsive species of bold, uninquiring, contemptuous dogmatism. It is not the trembling ague of the understanding, but the bad and burning fever of the heart. Hence it is, that it developes itself—not in the modest doubt and compassionable hesitation—not under the type and with the symptoms of a disease purely intellectual,—but in the starts of frenzied and infectious profanity,—in grumbling reproach and deep resentment, compared with which the levity of Voltaire himself is but the sting of an insect to the rabid ferocity of a tiger."—*Edinburgh Monthly Review, No. X.*

It may be worth while to compare, with this correct and forcible delineation of the character of Byron, the candid acknowledgement of another modern poet, not inferior, though certainly unlike in genius, whose testimony to the value and truth of religion may be conceived to derive a recommendation from the commonly admitted obliquities of his own conduct. " If, (says Burns, in one of his letters to Mrs Dunlop,) if religion is a mere phantom, existing only in the heated imagination of enthusiasm,

> " What truth on earth so precious as the lie!"

My idle reasonings sometimes make me a little sceptical; but the necessities of my heart always give the cold philosophizings the lie." Writing to Mr Cunningham, in a state of distress, he thus expresses himself very fully: "There are two great pillars that bear us up amid the wreck of misfortune and misery. The ONE is composed of the different modifications of a certain noble stubborn something in man, known by the names of courage, fortitude, magnanimity. The OTHER is made up of those feelings and sentiments, which, however the sceptic may deny them, or the enthusiast disfigure them, are yet, I am convinced, original and component parts of the human soul; those *senses of the mind*, if I may be allowed the expression, which connect us with, and link us to, those awful obscure realities—an all powerful and equally beneficent God, and a world to come, beyond death and the grave. The first gives the nerve of combat while a ray of hope beams on the field; the last pours the balm of comfort into the wounds which time can never cure." And, again, to Mrs Dunlop, not long before his death, he says, "With all my follies of youth, and, I fear, a few vices of manhood, still I congratulate myself on having had in early days religion strongly impressed on my mind. I have nothing to say to any one as to which sect he belongs to, or what creed he believes; but I look on the man, who is firmly persuaded of infinite wisdom and goodness superintending and directing every circumstance that can happen in his lot, I felicitate such a man as having a solid foundation for his mental enjoyment; a firm prop and sure stay in the hour of difficulty, trouble, and distress, and a never-failing anchor of hope when he looks beyond the grave."

Though it be admitted that the descriptions of poetry left us by the ancients are overstretched, yet if we believe that there is such a thing as an original genius, or, to give it no higher name, a potential capacity or aptitude in some persons which is not in others, and which essentially conduces to excellence in poetry, as well as in the fine arts, we must allow that there is more in these descriptions than declamatory eulogy and rhodomontade. And be it remembered, they who are capable of observing the exercises of their own minds must know that there are times in which, in consequence of some accidental thought or fortuitous impression from without, the imagination seems to slip alike from the control of the judgment and the efforts of the will, and to riot almost ungovernably among the beings and scenery of an ideal creation. It would be absurd to say that the ancients enjoyed a larger share of this fancy-possession than the moderns; but there is reason to think, that at least the opportunities and freedom of such enjoyment are a good deal lessened in modern times, to those who write poetry *for the public*, by the very circumstance of the labour of criticism which it is found necessary to practise, in order to secure conformity to artificial laws established for the judgment of readers. Thus says Mr Hayley, very beautifully, in the fifth canto of the Triumphs of Temper:

"Why art thou fled, O blest poetic time,
When fancy wrought the miracles of rhyme;
When, darting from her star-encircled throne,
Her poet's eye commanded worlds unknown;
When, by her fiat, made a mimic god,
He saw existence waiting on his nod,
And at his pleasure into being brought
New shadowy hosts, the vassals of his thought,
In joy's gay garb, in terror's dread array,
Darker than night, and brighter than the day;
Who, at his bidding, thro' the wilds of air,
Rais'd willing mortals far from earthly care,
And led them wondering thro' his wide domain,
Beyond the bounds of Nature's narrow reign;
While their rapt spirits, in the various flight,
Shook with successive thrills of new delight.
Return, sweet season, grac'd with fiction's flowers,
Let not cold system cramp thy genial powers," *&c.*

It may be said that change in manners and the nature of society has done more than the cause now assigned to dilute our poetry. This may be very true; but it does not therefore follow that this cause has not had the effect alluded to, which is all that is now asserted; and, for the truth of the assertion, an appeal may be made to experience. But the two causes, in fact, are intimately connected. A change in manners brings a change in language, and alters even the principles and fashion of criticism. "One cannot, without compassion," (says the ingenious writer of the Enquiry into the Life and Writings of Homer,) "think of a poor poet writing under the terror of the inquisition. He knows not but such a verse may give umbrage to a Right Reverend Father *Inquisitor*; another to a Reverend Father *Prior-Inspector*; this simile may startle the Father *Deputy-Revisor*, and that allusion seem dangerous to the *Vicar* himself. No wonder if the frighted author, haunted with such *sable spectres*, instead of *muses*, is delivered of a distorted production. Their ghostly appearance must damp every liberal thought. The mind does not exert itself, but *crouches* under the panic of a censure backed with the secular arm to enforce it." How usual is it for poets in our country to express their fears of a more recent inquisition, the society of reviewers, and how many are the ingenious contrivances to secure a favourable reception from them!

In early times, on the contrary, before the laws of such a tribunal were promulgated, and we must recollect that they were founded on previously existing specimens of the art which they were destined afterwards to restrain, such opportunities were most eagerly coveted by the votaries of the muse, and were enjoyed without fear, nay, rather with an encouraging belief of their supreme efficacy and importance; and, accordingly, they gave rise to those rhapsodies, wild, indeed, yet sublime, which the moderns, amid all their refinement and criticism, have continued to admire, but which they have rarely had the resolution to imitate, and never the power to excel. Indeed, even an attempt to imitate implies a peculiar effort of attention, which in all probability is inconsistent with that freedom of fancy which is necessary to ensure success to the endeavour of the poet. There will be found, accordingly, in all such attempts, greater cause to admire his art and judgment than his feeling and simplicity. What Sir William Temple says of those rules of the art of poetry which have been handed down to us from the time of Aristotle, is perfectly applicable to such imitation: "After all, the utmost there can be atchieved or pretended by any rules in this art, is but to hinder some men from being very ill poets, but not to make any man a very good one."

But, leaving the descriptions and the opinions of the ancients, which go but a little way in ascertaining the nature and extent of poetical licence, let us consider how far the writings of the moderns assist us in the present inquiry. Here Mr Vigors tells us, in very plain terms, that "though various writers have touched on the subject, and have sheltered many seeming anomalies in poetry under the general term licence, yet they have nowhere defined with accuracy what the term signifies." The principle, he admits, is acknowledged in the works of both poets and critics; in some passages, he also allows, that a description of its nature is cursorily attempted, and that, in others, some bounds are partially prescribed to its power: "But," says he, "in the only attempts wherein they have undertaken to define its nature, they are found either to give too great a latitude to its meaning or to circumscribe it within too narrow limits;" and a passage is quoted by him from Dryden's Apology for Heroic Poetry and Poetic Licence, prefixed to the 'State of Innocence,' in order to prove the former of these points, namely, that too great a latitude of meaning has been given in modern times to the term, when it is described as that particular character which distinguishes and sets bounds between poetry and prose. The error of this definition, he seems to think, is shewn by a single instance: "Verse," says he, "which constitutes an *essential* difference between both kinds of composition, is not *in any respect of a licentious character*, however included in this description." But this sentence, it is apprehended, conveys two assumptions, which, though convenient for the author's theory, are quite unwarrantable. If verse constitute an *essential* difference between poetry and prose, it follows that poetry must always appear in it, which is contrary to fact; and it need not be added, that prose, on the other hand, not unfrequently stalks about in the stilts of verse. Witness, as to the former point, the genuine poetry of many parts of Scripture; but as to the latter, it might be held invidious to specify instances of *correct* verses which have not a single sprig of true poetry to adorn them. We may quote, however, as in some degree applicable, the words of no inadequate judge, when speaking of a different subject, the accomplished Cowper, in the preface to his translation of the Iliad, where he defends the use of blank verse against the objections of those who are unreasonably partial to rhyme: "To rhyme in our language demands no great exertion of ingenuity, but is always easy to a person exercised in the practice. Witness the multitudes who rhyme, *but have no other poetical pretensions.* Let it be considered, too, how merciful we are apt to be to unclassical and indifferent language (we add, to arrant nonsense) for the sake of rhyme, and we shall soon see that the labour lies principally on the *other side.* Many ornaments of no easy purchase are required to atone for the absence of this single recommendation." We give a sentence or two more from the same authority, which we think it necessary to adduce, in order to ward off an objection which might be made to the present argument on the subject: "If to these labours (which Mr Cowper has mentioned as necessary for the production of blank verse) we add others equally requisite, a style in general more elaborate than rhyme requires, farther removed from the vernacular idiom both in the language itself and in the arrangement of it, we shall not long doubt which of these two very different species of verse threatens the composer with most expense of study and contrivance. I feel it unpleasant to appeal to my own experience, but, having no other voucher at hand, am constrained to it. As I affirm, so I have found. I have dealt pretty largely in both kinds, and I have frequently written more verses in a day, with tags, than I could ever write without them. To what has been here said, (which, whether it have been said by others or no, I cannot tell, having never read any modern book on the subject,) I shall only add, that to be poetical without rhyme is an argument of a sound and classical constitution in any language." It is quite allowable to apply similar remarks to verse of any kind; and, in opposition to the other assumption of Mr Vigors, paradoxical as the opinion may seem on first view, it is contended that verse is really of a licentious character, and is accordingly to be judged of in the same way as all the other freedoms used by a poet in order to accomplish the objects of his art.

Verse, it will be at once granted, is not the language of nature. It implies the exertion of thought, of memory, and judgment; and though it seems to have constituted the form in which composition in language first appeared, as a fit indication of design, yet it must have been founded on the accidental noticing of what sometimes occurred in spontaneous conversation. But, not to lay any stress on the highly probable opinion, as to the Hebrew poetry not having adopted verse of any kind for its medium, that verse was not originally restricted to what is properly called poetry, appears from a circumstance sufficiently authenticated, namely, that it was used, for the sake, probably, of helping the memory (on perhaps physical principles) in the laws and maxims of early times, and among rude people, and that it has continued for a similar reason through many ages, even till the present period, as may be seen in the generality of monkish rhymes, the precepts of the *Schola Salernitana*, certain books on husbandry, and other subjects. Why, or at what time, poetry assumed almost exclusively the garb of verse, formerly common to it and prose, does not appear, but may be guessed at with some probability of success.

The great distinctions of poetry are to be found, 1. In its intention, for it is directed to the excitement of the imagination; and, 2. in the means it uses to fulfil that intention, what Dr Johnson, taking rather a limited view of the subject, very happily denominates bold fictions and ambiguous figures, an expression which, without qualification, can hardly be said to comprehend sacred poetry. Now verse, which, besides that it indicates design, and is in itself pleasing, might be had recourse to, either because appropriate to the display of design and contrivance, or, in those cases in which the poetic genius was inconsiderable, as a substitute for a more powerful apparatus. It is therefore a privilege to some persons of inferior powers; and in so far as it is difficult of execution, it is of course entitled to a portion of praise which might not otherwise be merited: To others, again, it is a restraint which they would willingly throw off, if the taste and prejudice of the time tolerated the audacity. And, indeed, judging from the success of recent specimens, there is reason to believe we are near to the period in which the spirit of poetry will be delivered from its thraldom, and universally recognized, as it is partially, by the best judges, in language which has no merely mechanical charm to recommend it. Whilst, then, there appears ground for differing from Mr Vigor on this part of his argument, and for thinking that he has been hasty in his assertion respecting the opinion of some of the moderns about poetic licence, it is admitted that he is quite right both in condemning those authors who "straighten it to the immunities of mere poetical diction," and in believing that there is still room for an effort to complete the definition of the term, and to determine the limits which ought to be allowed for the exercise of the principle in question. Both of these points he has endeavoured to accomplish in the course of his inquiry. As to the former of these, it is his great object to prove *negatively*, that neither art nor nature is or can be the peculiar or exclusive standard from which a poet is said to depart in using licence; and, *positively*, that science is exclusively the standard from which he deviates.

It is assumed by him, and will be generally admitted, that the compositions of the fine arts are intended to minister to the superinduced or artificial gratifications, and not to the necessities of mankind. In addition to this principle, he asserts what is neither necessary for his reasoning nor clearly borne out by their history, that, in consequence of this peculiarity in their object or end, these compositions seem to claim an exemption from that exactness and regularity of representation which characterize works of utility. But that this assertion is not necessary for his theory, is shewn pretty evidently by his never recurring to it, or availing himself of it in any part of his reasoning; and that the history of the fine arts does not support it, may be demonstrated by a few observations. The fine arts furnish works of design, which as such are capable, in the first instance, of producing the emotions of beauty; but where adaptation to some *necessary* purpose, which of course implies design, is excluded, as in the case of the fine arts, perhaps the next obvious indication of design they have is the regularity of their composition. The artists, in rude times and nations, were quite aware of this tendency of mankind to infer the existence of design from the regular appearances of those objects which were presented to them; and, accordingly, took care to render these appearances so very conspicuous as not to be mistaken or unobserved by the most careless examiner. The greatest skill of the artist would be imagined to consist in the most perfect imitation of things which themselves presented exactness or uniformity, whether arising from some effort on the part of man or the conformation of nature. Perfection of imitation, accordingly, is the grand aim of the artists of rude nations. Fitness or utility alone would, in such times, characterize the productions of the useful arts, as uniformity or regularity of representation alone would the compositions of the fine arts; and the time seems to have been long before the former were conceived capable of the union of some of the beauty of the latter, or these were permitted to abandon regularity of appearance for the sake of accomplishing some higher indication of design. The difficulty, in short, has always been to combine the greatest fitness with the highest ornament in works designed for use; and some of the noblest efforts of human genius have been expended in raising the fine arts from the infancy of imitation, in which they can only please or produce wonder, to that state of creative power in which they can excite the feelings or even control the passions of men. In this condition, which indeed is rarely witnessed, exactness and regularity are altogether overlooked, both by the artist and by those on whom he operates; and as his object is elevated above a desire to please, so their minds are too much affected to regard merely secondary claims or subsidiary embellishments. In the case of the poets, therefore, considered as artists, either all of this superior class would require to be kept out of view, when treating of poetry on Mr Vigor's principle, or his reasoning respecting it must be limited to those inferior species which are intended merely to please, and in which it has been shewn, in opposition to his statements, that the appearance of regularity or exactness is necessary, or materially conducive, to the production of the emotions of beauty. It is scarcely necessary to apprise the reader, that the highest kind of poetry is that of the sacred Scriptures, to which, accordingly, it is believed that it is absolutely impossible to apply the limited argument now discussed. Here, then, it may be said, the art of the poet borders on that of the orator, so true are the observations of the author of the Essays on the Characteristics, though the distinction he makes between their objects be obviously neutralized by them. "The immediate essential end of poetry is to please, of eloquence to persuade, of argument to instruct. To this end, the poet dwells on such images as are beautiful; the orator selects every circumstance that is affecting; the philosopher only admits what is truth. But as all these, in their several kinds of writing, address themselves to man, who is compounded of imagination, passion, and reason, *so they seldom confine themselves to their respective provinces*, but lay hold of each other's art, the more effectually to gain admission and success to their own."

The general principles of poetic licence may be sufficiently ascertained from an examination of the conduct of what is called the *fable*; and to this the following remarks are confined.

The fable may be considered, according to the arrangement of Aristotle, in a two-fold division; namely, as consisting of, 1. Historical incidents; and, 2. Marvellous incidents.

The first duty of a poet, who engages in the higher efforts of the art, is to fix on a subject sufficiently important to excite the interest, and preserve the attention, of his reader: for it is certain, that, however well fitted some trivial circumstance may be for the lighter species of poetry, the labour and embellishment requisite to epic composition would occasion disgust if not applied to events and characters proportionally great and important. History, suppose, then, is applied to for a subject, and supplies it, as the ground-work of a poem; but history, we know, rarely presents such a continuity of events dependent on one source, or allied to one subject, as can ensure the elevation and uninterrupted impressiveness which an epic poem must maintain. In case of this deficiency, accordingly, the aid of invention is called in; and this aid is properly enough adduced by the poet, because it is known that the liberty of fiction is conceded to him, and because he is not answerable to any *moral* tribunal for the truth of his narration. Historical truth, preserved in his outline, gives importance to his work, but invention may supply much of its ornament and power of pleasing. He is therefore divided in his choice between these two sources of interest. The question to be determined is, What are the nature and extent of those licences in which he may be indulged in taking either direction? in other words, what are those deviations from the science of history in which a poet may be indulged with a view to accomplish the end of his art and undertaking? Here, then, it must be observed, that as the subject of the poem is taken from history, and is therefore to be supposed known, or at least accessible, an alteration of it, or of any of its leading features, cannot be made without weakening the effect of the composition, by inducing comparisons in the mind of the reader, offending his judgment, and contradicting his knowledge. From this consideration, exclusively of any other, it would seem, that the historical poet must conform, if not entirely to truth, certainly to the appearance of it; and, on this ground, the conduct of Lucan in the *Pharsalia*, and Addison in the *Campaign*, may be defended against the objections of those critics who have charged them with too rigid adherence to reality. Some practical conclusions deducible from this, may be expressed in few words. The historical poet may omit striking and well authenticated incidents, when they do not seem suitable to the end of his composition; but important incidents must not be altered, every alteration being a virtual, and, in most cases, an obvious vitiation of truth, which will have the unfavourable effects already specified. Incidents, important in themselves, may be ranked amongst the unimportant ones, if there be existing any, and particularly strong doubts, as to their truth or authority; and, on the other hand, a low degree of authority or apparent truth in incidents may be allowed to warrant a poet in using them. Over *subordinate* incidents, the power of the historic epopee has the greatest sway. The artist may alter, omit, or introduce, as contributes most to his purpose; and they may be considered as subject only to one restriction, namely, that they always preserve their *subordinate* character and situation. The poet is allowed to introduce somethings, provided they appear probable, which the historians may not have recorded. The speeches of heroes are of this kind, and often powerfully contribute to the interest of the composition.

The direct opposite of the historic epopee is the *epic romance*. Here the matter to be ascertained is the converse of that already discussed, namely, How far is a poet privileged to introduce genuine history into a composition avowedly and fundamentally romantic? There is no difficulty in deciding this question, provided the principles already laid down be considered as established; and a single sentence will express all that is necessary to be said on the subject in this place. History is to the romantic epos what fiction is to the historical epos; and it is to be excluded, saving under some very peculiar circumstances, which need not be enumerated, but which will be understood to be the counterpart of those in which fiction, or the introduction of marvellous incidents, is allowed to the historic epos.

The term poetical epos is appropriated to that species of composition which is equally allied to facts and to fiction, and which, consequently, admits the greatest interest and the highest embellishment. The research, as to the licence allowed in it, may be followed out in a threefold division. 1. May the poet take his subject wholly from invention? 2. Or may he derive it wholly from history? 3. Or, taking a middle course between truth and fiction, what proportion of each is he constrained to preserve; what licences in fact may be taken in what is historical and what is fictitious in his subject? Tasso was of opinion that an epic poem ought not to be founded on a fictitious subject. In this opinion, though not always for the same reasons, other critics have concurred; and the point may be reckoned as determined, so far as authority is concerned. The decision of the second question is equally simple, and has in some respect been already given in discoursing of the historical poem. Neither fiction nor authentic history, especially if of a recent event, can be properly admitted as exclusively the foundation of the poetical epos; and the poet, accordingly, is constrained to adopt the middle course between both. The licences which he may take in respect of these are now to be mentioned. The advantages of the epic poet might be conjectured to be greater than those of the historical or the romantic poet, and experience fully attests the fact. A rigid adherence to history, with all the licences which have been conceded, can only secure truth and dignity; and, on the other hand, the romantic poet is obliged to sacrifice these in order to heighten the interest of his fable, by the addition of circumstances which have no existence save in his own fancy. But the poetical epopee, which, in nearly equal proportion, takes the aid both of history and invention, where and how they may be most conspicuously operative, is capable, by this union, of imparting the highest gratification of which the art of poetry is susceptible. If he take his subject from history, as he ought to do, he must be careful to select it from the authentic records or the traditions of very distant times, so that he may, with the more ease, and less chance of detection, model the incidents of the story to suit his own peculiar purposes. The character of those times, independently of their being remote, which is favourable to the excitement of wonder and curiosity, is that of credulity and superstition, and therefore conduces to the introduction of supernatural agents and marvellous imagery. He is permitted, moreover, it is almost needless to mention, to enjoy the privileges of the historic poet, namely, of altering, omitting, or introducing *subordinate* incidents, and that, too, on far less authority or appearance of historical support. "The licences of this kind," says Mr Vigor, "which might be exemplified from any epic poem, are those which place the most marked distinction between the respective provinces of epical and historical poetry; and so extensive a range do they open to the former, that they appear to place it under scarcely any historical retriction but that of deriving from fact the main action of the subject, the actual scene of its transaction, and the principal characters by whom it is conducted."

In regard to the drama, another grand department of poetry, two questions seem to comprise all that it is necessary to state on the subject of licence.

1. May the poet derive his subject wholly from invention, or should he take it from history? 2. In founding a drama on historical facts, how far is he licenced in deserting historical authority, first, where the factsh appen to be of remote, and, secondly, where they are of recent occurrence? The principal arguments of those critics who have restricted the dramatic subject to history, are founded on the notions that the same rules which apply to the epic poet, confining him to history, are equally applicable to this case, and that greater truth, dignity, and importance are imparted to the drama by its union with history. To the first of these notions it is sufficient to reply, that an epic poem is addressed to the unimpassioned judgment and the tranquil exercise of the taste of a reader; whereas it is the intention of the drama, by an *actual representation* of difficult and trying circumstances, to rouse those passions of our nature which would be excited if the same or similar circumstances were to occur in real life. Our opinion of the truth of the history, founded on by the epic poet, secures a high degree of attention to what he relates, and is materially concerned in the pleasure we experience from his composition; but in the case of the drama, we *see* enough before our eyes to agitate our minds, and prevent our forming any opinion whatever as to the former existence of the things made the ground-work of the representation. The very nature of this representation, we may remark, will afford a satisfactory reply to the idea that greater truth is given to the drama by the alliance of it with history. It would seem that the subject of the drama may be taken indifferently from history or invention, and the history of the stage countenances this opinion; and the experience of those persons who have made the subject a matter of practical investigation may be safely appealed to in behalf of the main fact, that dramatic representations have equal effect on an audience, whether the one or the other be the foundation of the incidents represented.

As to the second question, we may mention briefly what pretty evidently follows from the foregoing hints, that when history is chosen by the dramatic poet, he is subject to nearly the same restrictions as those which are binding on the epic poet. The opinions and practice of Dryden may be adduced to this effect; these, again, are sanctioned by the authority of Horace; and on this ground the conduct of Shakspeare, in some of his historical plays, may be amply defended.

History is not the only science from which a poet may be said to depart in using licence. He may deviate in his descriptions, and in the introduction of objects, from those natural appearances and beings which are continually or usually presented to our notice. In a word, he may employ preternatural scenery and characters, and, in so doing, is very properly said to depart from the science of nature, those systematized general laws which have been deduced from the uniform concurrent observations of mankind. The prime intention which ought to actuate him in using such licence, is here, as in the former case, that of rendering his composition more striking, or better fitted to excite the interest and promote the pleasure of the reader. The most important restrictions which it is requisite to specify, as those to which the licence of marvellous invention must be subjected, are capable of being given in few words. Marvellous incidents ought to appear conformable to the ignorance, the prejudice, and superstitions of the times and people which they respect. They are totally inadmissible if positively false, and obviously contradictory to the notions of the reader. In other words, the natural feelings, both of his readers and the characters and times of his subject, as wrought on by peculiar systems of religious opinion, are to be chiefly regarded by the poet in the use of preternatural imagery. But the circumstance of a specific delusion on the part of one or more of his characters, provided it be stated to the reader, may enable the poet to introduce imagery which would otherwise be inadmissible; and, could something similar be presumed already to exist on the part of his readers, the same licence might be used. Thus far, then, it is easily admitted that the poetical romance, and we may consider allegorical poetry as allied to it, permits the aid of marvellous incidents.

Some powerful objections, however, have been made to the introduction of marvellous incidents in the case of the poetical epos. But the opinions of the moderns, reckoning from the time of Charles II. in England, have gradually tended, in opposition to the arguments of a few respectable critics, to favour their use, under certain restrictions. Judging from the main end which all poetical compositions ought to pursue, that of the highest gratification attainable by the art, one might not feel much incommoded by any reasonings or authorities urged against the use of means susceptible of being so directed.

The use of preternatural agents, in the case of the historical epopee, is altogether improper; for the same reason that excludes fiction from its incidents, extends equally to the proscription of those embellishments which are attained by machinery.

The introduction of such machinery in the compositions of the drama, is countenanced by the success of some modern productions. But, independently of this experience, some arguments might be advanced which seem to confirm to the drama the right to call in its aid; and the objections made to it by Aristotle and Horace, though perhaps applicable to the imperfect nature of theatrical representation in their day, lose their force when judged of in reference to the improvements of the stage in modern times.

In place of pursuing the subject of licence farther, and determining, or endeavouring to determine, the application of its principles to the other component parts of various kinds of poetry, it may be more agreeable to point out some of the distinctions which ought to be preserved between works intended for the stage and those which are confined solely to the closet. They result from the exposition now given of the language of nature. But there is a preliminary question, to which it is essential that we provide a solution, of some sort or other, as it bears decidedly on the very foundation of our intended structure.

Human nature is, beyond all doubt, the highest source of interest to all who partake of it; and the remark is, therefore, well entitled to the dignity of an axiom, "The *proper* study of mankind is man." Now we have seen how strong the disposition is, and how numerous are the excitements, to ascribe the passions, and the feelings, and the judgments of our own physical and moral systems to insensient objects; that in fact every powerful or highly-raised affection of our minds produces a tendency to poetical personification; and that, accordingly, poetry, genuine poetry, is really the result of constitutional principles wrought up to a certain degree of intensity beyond the moderation and uniformity of ordinary life. But though the impetus be thus furnished by any strong passion, it is very probable that there is a peculiar faculty of the mind, the precise office of which it is to go forth on the occasion, and to cull from the variety of material objects those images in which passion delights to array itself. Without examining this point, however, which is only incidental to our present purpose, let us contemplate our fellow-creatures themselves as "parcel of the universe," and certainly not less liable than inanimate substances to become the objects with which, when we are under the influence of the poetic fervour, we share our emotions and intelligence. The impassioned soul converts trees, and rocks, and mountains into perceptive and thinking beings, and elevates the lower animals to be partners of our joys and sufferings;—how much more may we not conceive those who are "bone of our bone, and flesh of our flesh," to be pregnant with all the vivid sympathies which chequer our existence? Thus, the man who, after many years absence, visits his native land, sees a brother in every one he meets with on his landing; the victorious soldier, just escaped from the carnage of the field, thinks every pacific face illumined with the proud thankfulness that glows in his own breast; to the fortunate lover there seems an air of tenderness and affection diffused over society, which he had never observed before; and the mother of a new-born child perceives a gladness in all around her, which perfectly harmonizes with and enhances her own delightful sensations. Examples of an opposite nature, but equally illustrative of the same principle, might easily be adduced both from daily experience and the writings of poets. But it is not necessary: and in short every reader must know how greatly his ideas of the expression of the countenances, and the manners of his acquaintances, are modified by the present condition of his own mind. There is, however, a marked difference between our fellow-creatures and every other creature or thing to which we may ascribe temporary consciousness; and the difference obviously consists in their possessing what these do not enjoy, the power of actually corresponding with us touching all the peculiarities which we may experience. Whether this power manifest itself in agreement with our feelings or in opposition to them, it is equally the source of interest; and we cannot but be frequently sensible of it, from the very circumstance of its influencing our thoughts, if not our behaviour. Extend the operation of this power throughout society, conceive it to be felt, and to be necessarily submitted to by every individual who partakes of our nature, in whatsoever circumstances he is placed, there will appear an ample cause of all the sympathies and antipathies to be found in life, which do not arise directly from the primitive affections and propensities of our constitution as gratified or thwarted by passing events. In other words, this correspondence, or communion in the language of nature, is a source of satisfaction, whatever be the state of mind in which it occurs, or the objects to which it is subservient; and, be it remarked, the employment of arbitrary language, or merely conventional terms, is no way essential to this correspondence, though it may, and certainly often does, contribute to its intensity and perfection. Keeping this principle in view, then, the question to be considered is, What is the source or cause of the pleasure we take in representations of scenes and characters which excite pity and other painful emotions? Various solutions of this question have been given, and some of these require to be mentioned and disposed of.

It has been imagined by certain writers, that such cases cannot be understood but on the supposition of a malignant principle inherent in us, which takes delight in the sufferings of others. That there is a propensity in our nature, the abuse if not the primary agency of which may lead to such a spirit, is quite conceivable, and indeed appears to derive support from too many examples of cruelty, independently of the desire of revenge or positive hatred, to admit of much controversy. But a little reflection will shew that this, admitting it to exist, affords a very partial exposition of the difficulty, and is quite inadmissible as a general theory, without very material qualifications, and assuredly so without the agency of the principle above stated. Laying it aside, then, for the present, let us contemplate some other hypotheses which have been advanced to explain the undeniable fact, that the mind takes pleasure in the representation of sufferings and calamities. Dr Campbell, in his Philosophy of Rhetoric, has entered at length on the subject, and begins his reflections with an examination of the theory maintained by the Abbe du Bois, which may be thus briefly stated.

Few things, according to this author, are more disagreeable than that condition of mind in which it is left when it has nothing to awaken the passions or arouse attention. To get rid of this uneasy listlessness, the mind has resource to any kind of amusement or pursuit that promises excitement, whether it be " business, gaming, news, shows, public executions, romances;" in short it matters not what, provided it accomplish the end, that of awakening the thoughts and stirring up a sense of interest; and the stronger it is in operation, the better for the purpose, and the more desirable to the individual. It follows from this notion, that " those passions, which, considered in themselves, are the most afflicting and disagreeable, are preferable to the pleasant, inasmuch as they most effectually relieve the soul from that oppressive langour which preys upon it in a state of inactivity. They afford it ample occupation, and, by giving play to its latent movements and springs of action, convey a pleasure which more than counterbalances the pains." In regarding this theory as incomplete, Dr Campbell concurs with Mr Hume in allowing that it may account for the pleasure taken in gaming, hunting, and several other diversions and sports; and he contends for its imperfection, chiefly on the ground that it does not account for the fact of poets, orators, and painters, exercising themselves on subjects calculated to actuate rather the painful passions than those that are pleasant, which last are, nevertheless, equally well fitted to preserve or recover the mind from a state of inaction, besides having, what one would naturally imagine a recommendation, the power of conveying an agreeable feeling. But even granting, what is by no means universally true, that passions of the former kind are the stronger of the two, mere superiority of strength will not explain why the preference is thus practically awarded to them. The reason is plainly deducible from the known effects of the arts in question when so exercised. It is clear, that the emotion which is sometimes excited by them is greater or more powerful than was required, or is consistent with pleasure; and that, accordingly, as is well known, horror and aversion are produced, when the representation of suffering, whatever it may be, or however conveyed, is beyond a certain degree of intensity and verisimilitude. The descriptions of the orator or the poet, it is correctly observed, may exceed any assignable measure which ought to be preserved; and, variable as this may be in the case of different individuals, " there is a common standard in what regards the faculties of the mind as well as in what concerns the powers of the body." Moreover, as is justly noticed by Mr Hume, and which seems decisive against the theory of Du Bois, " the same object of distress which pleases in a tragedy, were it really set before us, would give the most unfeigned uneasiness, though it be then the most effectual cure of languor and indolence." It seems, then, that mere strength is not the only quality in the passions which renders them capable of rescuing the mind from torpor, and imparts to them their recommendation for the purposes aimed at by the artist. Something else is requisite, and ought to have been pointed out in the theory, which is consequently incompetent to the exposition of the phenomena, and from which the most that can be concluded is, " the utility of exciting passion of some kind or other, but nothing that can evince the superior fitness of the distressful affections."

The next theory to be considered is that of Fontenelle, which Mr Hume, who, in some measure, supports it, has explained nearly in the following words. Pleasure and pain, though in themselves very different, do not differ so much in their cause. The instance of tickling shows that pleasure, when pushed a little too far, becomes pain; and that the movement of pain, a little moderated, becomes pleasure. Hence sorrow may be soft and agreeable. It is then a pain weakened and diminished. The heart loves to be moved and affected, and disastrous objects, provided they be softened down, are suitable to its nature. Dramatic representation has almost, but not entirely, the effect of reality; for, however we may be hurried away by the spectacle, or the senses and imagination for the time usurp dominion over the reason, there still exists an idea of the falsehood of the scenes passing before us; and this idea, weak and disguised as it may be, is sufficient to lessen the pain which we suffer from observing the misfortunes of others, especially those for whom we have a regard, and to " reduce that affliction to such a pitch as converts it into a pleasure." At the very time that we weep for the misfortunes of a hero to whom we are attached, we comfort ourselves by reflecting that it is all a fiction, and this mixture of sentiments delights us.—" But as that affection which is caused by exterior and sensible objects is stronger than the consolation which arises from an internal reflection, they are the effects and symptoms of sorrow which ought to prevail in the composition." This theory is obviously built on a narrow foundation, and will not be found applicable to many cases which come under the range of the question. It also involves a point of the nature of a *petitio principii*, which, as it seems to us, cannot be granted, without evading the very essence of the difficulty that is to be overcome. We allude to the notion of falsehood, of which the mind is said to avail itself, in order to prevent the representation or narrative from having too strong an effect on the feelings. Dr Campbell considers this point the only truth discoverable in the theory; but in reality it is not always found to exist, and, of course, where it does not, the theory, which is useless without it, is inapplicable. Besides, as is remarked by him, " this notion is not a necessary concomitant of the pleasure that results from pity and other such affections, but is merely accidental." It is perhaps had recourse to only when the afflictive operation is so excessive as to induce the mind to seek every mode of relieving itself from an insupportably painful feeling; and we may be sure that when this is the case, the artist has transgressed the bounds of licence. The proof that he has done so, and that the remedy is had recourse to only when the sympathetic sorrow is too intense, may be made apparent by these three considerations: *First,* That though writers aim generally at pleasing rather than shocking their readers, they, nevertheless, endeavour to make their most affecting stories firmly believed, and are careful, to the extent of their judgment, to avoid those circumstances which would occasion their representation to be disbelieved. *Secondly,* that there is a common tendency and inclination in mankind to believe what moves them strongly, and, of course, an unwillingness to believe that it is fictitious,—which can result only from a consciousness or suspicion, perhaps derived from experience, that any portion of disbelief, in place of increasing, would diminish their pleasure; so " they must be very far," as Dr Campbell justly observes, " from entertaining Fontenelle's notion, that it, namely, disbelief, is necessary to the producing of this pleasure; for we cannot well suspect them of a plot against their own enjoyment." And, *thirdly,* that there is a sensible delight in reading or hearing the most tragical narrations of the historians and orators in whose veracity and correctness we implicitly confide; and the same thing might be said of certain productions of the fine arts, of the fidelity of which to truth we do not entertain a doubt. It is scarcely necessary to add, in opposition to the theory of Fontenelle, that there are many cases in which, however much the cause of a painful sensation or of a mental suffering be diminished in agency or power, its effect remains precisely of the same kind, though less in degree; and that in all such cases the theory is perfectly inadmissible.—Some instances of the kind are adduced by Dr Campbell, who seems to hold them as utterly irreconcileable with its fundamental principle. " A gross and public insult commonly provokes a very high degree of resentment, and gives a most pungent vexation to a person of sensibility. I would gladly know whether a smaller affront, or some slight instance of neglect or contempt, gives such a person any pleasure. Try the experiment also on friendship and hatred, and you will find the same success. As the warmest friendship is highly agreeable to the mind, the slightest liking is also agreeable, though in a less degree. Perfect hatred is a kind of torture to the breast that harbours it, which will not be found capable of being mitigated into pleasure; for there is no degree of ill-will without pain. The gradation in the cause and in the effect are actually correspondent." But though he denies that different degrees of any uncompounded passion are productive, as is alleged in the theory, of contrary effects, he admits that when passions of various kinds are blended, some of which are pleasing and some painful, either the pleasure or the pain of those which predominate may be augmented by the mixture. He does not state in what manner this is accomplished, but ascribes it vaguely enough to the " wonderful mechanism of our mental frame," from which it may be inferred that he felt considerable difficulty in explaining it. The truth is, that the existence of such mingled sensations or passions, at the same instant of time, is less frequent than is usually believed, the emotions of each being consecutive, but so rapidly consecutive, that the intervals between them are too minute to admit of conscious attention; and that, even in such cases of supposed simultaneousness, either one kind of passion or emotion so predominates as to exclude regard to the others, or the conjoined operation of the whole is too powerful to allow the mind to sit in judgment on the mixture. It is certain, nevertheless, that several of the primitive faculties, propensities, and affections of the mind may be excited at once, or be brought, as it were, into combination; and it is no less so, that though they may be excited at once, it is not uncommon for them to oppose each other, and occasion a conflict in the mind. But, in the former case, their simultaneousness obviously involves agreement, not the mixture or contrast alluded to by Dr Campbell; and in the latter there prevails an indecision, a hesitancy, or an involved or a complicated condition of feeling,—which is almost always inconsistent with any degree of satisfaction, and is at all events unfriendly to such a balancing process as he asserts to take place.

Mr Hume's theory was proposed by him, not so much in place of the two hypotheses now considered, as a requisite supplement to them, for in some measure he maintained both. It is thus set forth by him: " What is it (alluding to the case in which sorrow is not softened by fiction) which raises a pleasure from the bosom of uneasiness, so to speak, and a pleasure which still retains all the features and outward symptoms of distress and sorrow? I answer, This extraordinary effect proceeds from that very eloquence with which the melancholy scene is represented. The genius required to paint objects in a lively manner, the art employed in collecting all the pathetic circumstances, the judgment displayed in disposing them; the exercise, I say, of these noble talents, together with the force of expression and beauty of oratorial numbers, diffuse the highest satisfaction on the audience, and excite the most delightful movements. By this means, the uneasiness of the melancholy passions is not only overpowered and effaced by something stronger of an opposite kind, but the whole movement of those passions is converted into pleasure, and swells the delight which the eloquence raises in us. The same force of oratory employed on an uninteresting subject would not please half so much, or rather would appear altogether ridiculous; and the mind, being left in absolute calmness and indifference, would relish none of those beauties of imagination or expression, which, if joined to passion, give it such exquisite entertainment. The impulse or vehemence arising from sorrow, compassion, indignation, receives a new direction from the sentiments of beauty. The latter, being the predominant emotion, seize the whole mind, and convert the former into themselves, or at least tincture them so strongly, as totally to alter their nature: and the soul being, at the same time, roused by passion, and charmed by eloquence, feels on the whole a strong movement, which is altogether delightful." It was necessary to give the words of the author himself in stating this theory, lest any injustice might be committed; for it is highly probable many readers will concur with Dr Campbell, in saying they are not certain that they understand his meaning, and in wishing that he had expressed himself more explicitly. But, taking it in detail, the following considerations may determine its claim to a satisfactory solution of the problem. If Mr Hume means, as he appears to do at one time, that it is the intention of the orator, or artist in general, in such instances as those to which he alludes, to awaken any passions or emotions, which, whatever be their abstract or original character, are incidentally accompanied with pleasure, as compassion, sorrow, indignation, he certainly affirms a well known truth, but one that, so far from explaining the difficulty, tends to aggravate it, or at least give it greater pre-eminence. No one doubts that it is the purpose of eloquence, for example, to excite the passions, and to please; and it is admitted to do both, by raising up striking or impressive images of sufferings and distress, and imparting to the mind ideas of them of so lively a character as to resemble the perceptions of sense; but this is the very circumstance which prompts the original question, or rather suggests it in another and a more perplexing manner. How can the aggravating of a scene of misery, by a careful selection and skilful representation of its most afflictive details, make it be regarded with pleasure?—or, in other words, Can any increase in the degree of the painful emotions of grief, fear, solicitude, ever render them more agreeable than they are naturally and originally?—and, on the contrary, will not such aggravation make them more and more painful? The obvious and the correct answer is destructive of the theory. If, again, Mr Hume proposed to affirm, as some of his words imply, that it is the discovery of the art of the orator, the perception of his ingenuity and ability, which imparts a pleasure to the mind, of a kind and force sufficient, when mingling with the painful emotions of pity, fear, or indignation, to convert the whole into one strong delightful sensation,—he asserts something in opposition to the wish and endeavour of almost all artists, who generally labour, as is well known, to conceal the means by which they produce their effects, and in no instance more studiously than in that of the orator when engaged in the pathetic, to do justice to which he must so entirely direct the attention of his hearers to the subject, as to make them quite regardless of himself and all the instruments by which he is operating on them. But independently of this objection, which is itself decisive, it is worthy of notice, that Mr Hume seems throughout to suppose, that there are two distinct effects produced by such eloquence, one, the sentiment of beauty, that is, the emotion consequent on the perception of the various qualities of the art itself, or the excellencies of the artists, and the other that passion or affection which it is his intention to raise in the mind; whereas, in point of fact, as is said by Dr Campbell, this passion or affection, and, be it remembered, we are chiefly concerned here with that of pity, arises "not from any extrinsic sentiment of beauty blended with it, but intimately from its own nature, from those passions which pity necessarily associates, or rather includes." It is no doubt true, that we commonly and properly speak of eloquence as moving us greatly, and at the same time pleasing us highly; but, on inquiry, it will be plainly perceived, that these supposed original and independent effects are essentially connected, and accordingly it is by being moved that we are pleased. The pleasure, therefore, springs from the passion itself, as the passion again is roused by the eloquence of the speaker. These remarks are by no means inconsistent with the admission of what every one knows to be true, namely, that there is a very perceptible pleasure in contemplating beauty of composition, or, in other words, discovering the excellencies of the artist, though they certainly imply that it is of a different kind from that which is directly occasioned by the art, or which spontaneously arises from the passion excited. Indeed the two are so different as to be almost incompatible, of which we have an incontestible proof in the very opposite conditions of the deliberative critic, upon whose passions the orator has little influence, and the generality of hearers, who, in the excitement of the moment, are totally regardless of the means by which they have been powerfully affected. Judged in relation to these contrary cases, the theory is glaringly in fault; and were there wanting any other consideration to induce us to lay it aside, we have it in a circumstance which is very properly adduced by Dr Campbell as hostile at once to it and to the principles of the hypothesis of Fontenelle, which Mr Hume laboured, by means of it, to support and perfect. "The particular alluded to is, that pity, if it exceed not a certain degree, gives pleasure to the mind when excited by the original objects in distress, as well as by the representations made by poets, painters, and orators: And, on the contrary, if it exceed a certain degree, it is on the whole painful, whether awaked by the real objects of pity or roused by the exhibitions of the historian or of the poet." "Indeed," continues Dr Campbell, "as sense operates much more strongly on the mind than imagination does, the excess is much more frequent in the former case than in the latter." Perhaps this last observation is rather unguardedly made, as it is not necessarily true that sense is more operative than imagination, and the history of insanity affords examples of the contrary, which is also capable of something like evidence in the state of high excitement occasionally experienced by actors and probably other artists; nevertheless, and taking it in the general, it is substantially correct, and must be allowed to give considerable extension to the original question, which obtains still farther interest, when it is adverted to, that pity is not the only emotion or affection, one degree of which gives pleasure to the mind while another is productive of pain.

In concluding his examination of Mr Hume's appendage to the theories of Fontenelle, Dr Campbell, who had confined himself chiefly to eloquence, thinks proper to make a special allowance for its partial operation in the case of dramatic tragedy. His words are: "It is very true that our theatrical entertainments commonly exhibit a degree of distress which we could not bear to witness in the objects represented. Consequently, the consideration that it is but a picture, and not the original, a fictitious exhibition, and not the reality, which we contemplate, is essential for rendering the whole, I may say, supportable as well as pleasant." Without disputing the fact, which, notwithstanding, is highly problematical, and at all events is by no means of frequent occurrence, he wards off its force as an objection, in this manner: "Even in this case, when it is necessary to our repose to consider the scenical misery before us as mere illusion, we are generally better pleased to consider the things represented as genuine fact. It requires, indeed, but a farther degree of affliction to make us even pleased to think that the copy never had any archetype in nature. But when this is the case, we may truly say, that the poet hath exceeded and wrought up pity to a kind of horror." Perhaps it would be more to the purpose to say, on the supposition of such a consideration taking place, which it no doubt does at times, that its operation in affording relief is altogether subordinate and subsequent to the pleasure directly derived from the representation, and consequently ought not to be brought forward as any way explanatory of the difficulty. But it may be seriously asked, as already hinted, whether such consideration be either so usual or so ready as to entitle it to any place among the facts comprehended or influential in the question? On this point it may be maintained, with some appearance of probability, that neither the professed habitual critic, whose original feelings are entirely subdued or greatly modified by the intellectual process which he carries on, nor the individual whose rarity of attendance on such spectacles is the best guarantee for their native unalloyed influence, consciously avails himself, at the moment of his highest excitation, of the idea of fiction, in order to counteract the too painful effort of the representation. Let readers, of one kind or other, judge for themselves, whether, when subjected to highly-wrought dramatic tragedy, energetically pourtrayed, their feelings have not been too rapidly hurried off, to allow time for such a sobering process. Perhaps the result of their own experience in the matter will dispose them to give credit to some examples of dramatic power, either furnished by a friend, on whose opportunities and talent for observation, as well as entire veracity, we do for our own parts implicitly depend, or taken from other credible sources.

During the performance of the melo-drama of Calas, founded on the authentic history of the family of that name, when Theodore, the plotter of the mischief which terminates so fatally, is seized by the collar, and threatened with death unless he divulge his villainous practices, a man in the gallery vociferated, "Strangle the rascal, strangle him." In that scene of the tragedy of *Othello*, where Iago, who is seen to snatch Desdemona's handkerchief from his wife, and secret it in his breast, immediately afterwards says to Othello,

> "Such a handkerchief,
> (I am sure it was your wife's) did I to-day
> See Cassio wipe his beard with;"

a voice was heard to exclaim, "It's a lie,—don't believe him. The villain has it in his bosom." When Octavian, in the *Mountaineers*, on recovering from a temporary insanity, recognizes his beloved Floranthe, and learning that she, whom he had supposed to be wedded to another, is still true to him, bursts into an ecstacy of delight, the interest of the scene is known to have proved so intensely exciting as to have caused ladies to be carried from the boxes in a state of insensibility. When the villain Appius is strangled by Virginius, in the modern tragedy so called, it is not uncommon for shouts to burst from the audience; and a general suppressed burst of horror, bordering on a faint scream, and evidently accompanied with shuddering, has been experienced when Virginius plunges the knife into the bosom of his daughter. It is somewhere on record, and seemingly well authenticated, that a soldier, employed as a centinel at the outside of a wooden building, used as a temporary theatre, through a seam of which he got occasional glimpses of what was passing on the stage, became so enraged at the individual who personated Othello, when proceeding to murder Desdemona, as to have pointed his musket at him, and swearing that "no black rascal should do so in this country," shot him dead on the spot. Many other instances of the powerful immediate effect of such representations might be given; and there are probably few persons who do not recollect the difficulty which they themselves experienced, in restraining certain emotions similarly occasioned, especially when they were young spectators of the drama. The list might be greatly augmented by reference to the biographical accounts of celebrated actors and the history of the stage. But this would be out of place here, and assuredly unnecessary to establish the truth of the proposition, that in many cases there is a temporary belief in the reality of what is thus represented. There is even some reason for thinking that the effect is occasionally of more considerable duration than is usually supposed. For example, the gentleman who has stated some of these facts, makes mention of a friend of his, who confessed, that after seeing him perform the part of Longueville, in the *Foundling of the Forest*, it was with considerable difficulty he could bring his mind to receive him with his usual welcome when he called at his house on the following morning. As certainly in great degree connected with the same causes, though no doubt some higher principles were concerned, it may be acceptable to most persons to extract the following note from a work which could hardly be expected to contain any thing so grateful to the feelings of humanity. "A gentleman one day called on Ross, the celebrated tragedian, when stricken with years, much dejected in his looks, and told him that his father, a wealthy citizen in London, lay at the point of death, and begged that he might see him, or (else) he could not die in peace. Strange as this request appeared from a stranger, and in such extremity, the actor hesitated; but being much pressed by his visitor, he agreed to accompany him. Arrived at the house of the sick man, Mr Ross was announced, and soon admitted into his chamber; but observing the family to retire, and being left alone with the patient, his suspicion was again aroused. The dying penitent, now "threescore and ten," casting his languid eyes upon Ross, said, "Can it be you, who raised my fortune, who saved my life? Then were you young like myself; aye, and amiable amid the direst misfortunes: I determined to amend my life, and avoid your fate." Here nature, in a struggle with death, became overpowered; and as the sick man's head fell upon his pillow, he faintly ejaculated, "O Barnwell! Barnwell!" We may conceive the astonishment of the player, whom age had long incapacitated from representing the unfortunate London apprentice. The feeble man, renewing his efforts to gratify a dying desire, again opened his eyes, and continued, "Mr Ross, some forty years ago, like George Barnwell, I wronged my master, to supply the unbounded extravagance of a Millwood. I took her to see your performance, which so shocked me, that I silently vowed to break the connection then by my side, and return to the path of virtue. I kept my resolution, and replaced the money I had stolen before my villany was detected. I bore up against the upbraidings of my deluder, and found a Maria in my master's daughter. We married; I soon succeeded to her father's business, and the young man who brought you here was the first pledge of our love. I have more children, or I would have shewn my gratitude to you by a larger sum than I have bequeathed you; but take a thousand pounds affixed to your name." At the dying man's signal, old Ross left his room, overwhelmed by his feelings." This story is said to rest on Ross's own authority.—(*New Newgate Calendar*, Vol. II. p. 36.)

Dr Campbell, in his examination of the various hypotheses on this curious subject, has not forgotten the theory of Hobbes, revived and exemplified as it was by Dr Hawkesworth, namely, compassion is "an example of unmixed selfishness and malignity," resolvable "into that power of imagination, by which we apply the misfortunes of others to ourselves;" that we are said "to pity no longer than we fancy ourselves to suffer, and to be pleased only by reflecting that our sufferings are not real; thus indulging a dream of distress, from which we can awake whenever we please, to exult in our security, and enjoy the comparison of the fiction with truth." It might to most persons be sufficient objection to this theory, to state, that it is one of the necessary appendages or consequences of the narrow and sophistical system which deduces all the affections and conduct of mankind from the principle of self-love; but for the benefit of those who, without being supporters of that system, or caring any thing about it, may be so far influenced by the generally, though by no means correctly, admitted opinion, that some fiction of the imagination is necessary to the production of pity, as to think there is something no less feasible in the fundamental principle of this theory than in that of others, it may be proper to specify one valid objection to which it is liable. It is this,—the universal conviction of mankind, not gained over to the hypothesis, as expressed in all known languages, that "in pity we are affected with a *real sorrow for the sufferings of others.*" Those who have never experienced this feeling are quite incapable of judging of the theory to which it stands in diametrical opposition; and, on the other hand, on those who, having experienced it, will, from the mere love of paradox or attachment to system, endeavour to explain away its decided bearing on the question, any other argument would probably be lost, which has for its object their abandonment of an idol.

An apology is made by Dr Campbell for attempting another solution of the question; but it will at once be granted by those who feel dissatisfied with previous theories, that he or any one else may, without culpable hardihood, hazard a new decision; for certainly, in all cases which fall under the cognizance of our senses, or can be reached by our faculties, and must be determined, if determined at all, by an appeal to experience, despondency, as he justly observes, is a greater fault than presumption. The following outline of his theory, it is hoped, is sufficiently correct and ample to pourtray its characteristic features, and determine its claims to our regard. If not so brief as might be desired, some indulgence is requested, on the ground that it is really far from being an easy matter to state no less than six abstract propositions, in a manner which shall at once distinctly define them, and so connect them as to make them bear collectively on a single point, which, after all, is just as intelligible in itself as any one of them taken singly.

1. Then, the simple passions of the mind are assumed to be of two classes, the *pleasant* and the *painful*, both of which differ from one another in kind as well as in degree. To the former class belong love, joy, hope, pride, gratitude; to the latter, hatred, grief, fear, shame, anger,—an enumeration in which it is proper to observe, *pride* in the one, or that feeling which we experience on obtaining merited approbation, is contrasted with *shame*, the feeling we have when conscious of incurring deserved blame. Two passions or affections, namely, *desire* and *aversion*, would have been added to the second class, because they give the mind some uneasiness or dissatisfaction, but that, on the other hand, they are sometimes the occasion of pleasure, by prompting the mind to action, and, besides this, are always accompanied with some degree of hope or fear, and are therefore either pleasant or painful. For these reasons they are accordingly held as intermediate, or indifferent. The reader will determine for himself how much is assumed in this proposition.

2. The passions now enumerated are said to be capable, as well as the ideas of the mind, of being associated together, or of attracting one another; and, we are told, it rarely happens that one of them exists alone. Almost all of them, it is true, excite either desire or aversion, but joy and grief, we are informed, less than the rest: and "of the two, (says the Doctor,) joy, I believe, will be acknowledged to have less of the attractive power than grief." His reasons for thinking so deserve to be mentioned, as highly illustrative of the train of thought which seems to have conducted him to his theory, and as no less certainly indicating the *personality* of his delineation. "Joy is the end of desire, and the completion of hope; therefore, when attained, it not only excludes occasion for the others, but seems, for a while at least, to repel pain, as what would give an impertinent interruption to the pleasure resulting from the contemplation of present felicity, with which the mind, under the influence of joy, is engrossed. Grief has a like tendency. When the mind is overwhelmed by

this gloomy passion, it resists the instigations of desire, as what would again, to no purpose, rouse its activity; it disdains hope, it even loaths it as a vain and delusive dream. The first suggestion of these passions, (he means *desire* and *hope*,) seem but as harbingers to the cutting recollection of former flattering prospects, once too fondly entertained, now utterly extinct, and succeeded by an insupportable and irremediable disappointment, which every recollection serves but to aggravate. Nay, how unaccountable soever it may appear, the mind seems to have a mournful satisfaction in being allowed to indulge its anguish, and to immerse itself wholly in its own affections. But *this can be affirmed of sorrow only in the extreme.* When it begins to subside, or when originally but in a weak degree, it leads the mind to seek relief from desire, and hope, and other passions." As a usual, or frequently occurring association, mention is made of love and benevolence, the former being understood to mean " a certain pleasureable emotion excited in the mind by a suitable object," and the latter " a desire of the happiness of the person loved." The only other instance of association specified, is that of hatred with *malevolence* or *malice;* though it will be remarked, that this, which he defines the desire of evil to the person hated, is not mentioned in either class of the passions. The picture which Dr C. draws in this proposition was probably a correct likeness of himself, but cannot be deemed suitable for all mankind.

3. The impression which pain of every kind generally makes " *on the imagination*" is deeper than that of pleasure, " and is longer retained by the memory;" for the truth of which proposition, an appeal is made to the common remark, " benefits are sooner forgotten than injuries, and favours than affronts," and to the experience of those who attend the theatre, as to the plots of the best tragedies being better remembered than those of the most celebrated comedies." Moreover, it is affirmed, " every body that reflects may be satisfied, that no story takes a firmer hold of the memory than a tale of woe;" and that, in civil history, as well as in biography, it is the disastrous, and not the joyous events, which are oftenest recollected and retailed." The only remark to be made here is, that every body is not so satisfied.

4. In the case of a group or combination of passions, some of which are pleasant and others painful, if the former predominate " there ariseth often a greater and a more durable pleasure to the mind, than would result from these, if alone and unmixed." Dr Campbell asserts this to be matter of fact, but says, ' how it happens to be so, I am afraid human sagacity will never be able to investigate,—" so that we are as far off as ever from a solution; and he conceives the observation to hold true, in an especial manner, when the emotions and affections raised are derived from sympathy, which is defined by him " that quality of the soul which renders it susceptible of almost any passion, by communication from the bosom of another," but which he affirms to be weaker in the instance of joy than in that of sorrow. Pursuing this remark, he thinks he can both assign the intention of nature in the difference, namely, the need which the miserable have of sympathy, and shew " why a scene of pure unmixed joy, in any work of genius, cannot give a great or lasting pleasure to the mind." With one of his alleged reasons for this last assertion, he is himself not quite satisfied; and, indeed, the whole may be passed over as of little avail to the theory advanced by him.

5. All the emotions excited by tragedy may be included under the name of *pity*, which, accordingly, is held to comprehend all those that result from " that species of eloquence which is denominated the pathetic." He disapproves of the common distinction between terror and pity, as a generic classification of the passions produced by tragedy; contending that, if it be received, as it is certainly incidentally occasioned, other sympathetic affections, such as hope, indignation, love and hatred, gratitude and resentment, are equally entitled, with pity, to be included. In this manner he evidently limits the question to be answered to the simple case in which a degree of pity, accompanied with a production of pleasure, is concerned; though he admits that the solution, which would be sufficient in it, might not apply to many cases, " in which," he says, " Abbe du Bos' account above recited, of the pleasure arising from the agitation and fluctuation of the passions, is *the only solution that can be given*," Dr Campbell's own solution, then, is not always needed.

6. " Pity is not a simple passion, but a group of passions strictly united by association, and as it were blended by centering in the same object." Some of those associated passions are pleasant, others are painful, but commonly the former prevail. He enumerates three of them as constituting the compound, namely, *commiseration*, which he deems purely painful: *benevolence*, " of the intermediate kind;" and *love*, which, as it implies " one of the noblest and most exquisite pleasures the soul can experience." he thinks sufficient of itself, in most cases, " to give a counterpoise of pleasure to the whole." To point out the influence of this last principle, and generally to confirm his theoretic views, he alludes to the practice of orators and poets, who, in order to strengthen the association among these passions or emotions, are careful ' to adorn the character of him for whom they would engage our pity with every amiable quality which, in a consistency with probability, they can crowd into it;" as, on the other hand, he maintains, without qualification, that the misfortunes of a hateful character are unpitied, and may in reality occasionally give pleasure to the mind, as examples of merited punishment. The effect of an exhibition of misfortunes borne by an intermediate character, that is, one in which, from the nature of good and bad qualities, we are prevented from either entirely withholding commiseration, or bestowing love, is, according to him, to *tear the mind* opposite ways at once, by " passions which, instead of uniting, repel one another." Not to speak of the mechanicalness of the Dr.'s ideas here, be it observed, there are at least four points advanced in this proposition all of which would require to be proved as universal truths, which it is confidently believed is impossible.

Such are the fundamental principles on which Dr Campbell erects his own hypothesis. They are evidently elaborated with great care on his part, and on this very account will be concluded worthy of serious notice. How unfortunate, then, must the writer of this sketch be, and how great his apprehension of being deemed either hypercritical or exceedingly stupid, when he finds himself necessitated to declare his conviction, that any truth contained in them is of so specific a kind, and so limited, both in degree and extent of application, as to be quite inadequate for the purpose intended by them; and, moreover, that this inconsiderable and unavailing portion of truth is blended with much matter which, if not demonstrably error, is only conjectural, and, therefore, of no authority. Without consciously doing the smallest injustice to the eminent author, or using a single expression with the spirit of which he himself would have been displeased, it was endeavoured, in the foregoing paragraphs, to direct the reader's attention to those points of the induction wherever the incorrectness of interpretation, the confusion of terms, the unphilosophical assumption of positions, and the weakness of argument which have prompted this opinion, are discoverable. Nothing more is needed, it is believed, than a careful reading of the analysis, to prepare any one for a similar sort of disappointment in that part of the Dr.'s essay which gives the application of it to the question proposed for solution. In reality, his theory is not built on those premises at all; and in so far as it is true, which it is to a great extent, its truth is scarcely any way connected with them. Still it is due to the character of Dr Campbell to commend the candour and the modesty with which he himself makes this application, or rather advances another statement, and allows the necessity for certain additions and restrictions in his theory. "All the answer," says he, "which I am able to produce upon the whole, and which results from the foregoing observations is this: The principal pleasure in pity ariseth from its own nature, or from the nature of those passions of which it is compounded, and not from any thing extrinsic or adventitious. The tender emotions of love which enter into the composition, sweeten the commiseration or sympathetic sorrow; the commiseration gives a stability to those emotions, with which otherwise the mind would soon be cloyed when directed towards a person imaginary, unknown, or with whom we are totally unacquainted. The very benevolence, or wish of contributing to his relief, affords an occupation to the thoughts, which agreeably rouses them. It impels the mind to devise expedients by which the unhappy person (if our pity is excited by some present calamitous incident) may be, or (if it is awakened by the art of the poet, the orator, or the historian) might have been relieved from his distress. Yet the whole movement of the combined affections is not converted into pleasure; for though the uneasiness of the melancholy passions be overpowered, it is not effaced by something stronger of an opposite kind."—"The combination of the passions, in the instance under examination, is not like the blending of colours, two of which will produce a third, wherein you can discern nothing of the original hues united in producing it; but it rather resembles a mixture of tastes, when you are quite sensible of the different savours of the ingredients." He allows that certain adventitious circumstances may contribute to heighten the effect, but cannot be regarded as essential to the passion; and he instances the satisfaction which arises from a sense of our own ease and security, and the satisfaction arising from the conscious exercise of the humane affections, which latter, though not immaterial, he reckons as adventitious, because not always nor immediately attendant on sympathetic sorrow. Some of his remarks on this head are peculiarly judicious, and, though not exactly connected with his own theory, deserve attention, as illustrative of a combination among the powers or faculties of the mind, which might, at first sight, be deemed incompatible. They are particularly alluded to at present, because, though not quite in harmony with his own theoretical speculations, they confirm certain remarks which were made as preliminary to the discussion of the question thus variously attempted to be answered, and because they will be found to agree remarkably with the principles of a system regarding the primary powers and functions of the mind,—of which, from its having recently engaged so much attention, as well as on account of its own merits, it will be imperatively necessary to take some notice elsewhere.

There is a conscious pleasure in the exercise of the benevolent affections, which children and very uncultivated persons may experience, without thinking for a moment that there is any merit in the feeling. Some may even possess the feeling who have been taught to consider it a weakness, and, in consequence, endeavour to conceal or subdue it; as it is certain that the spirit of a false religion has inculcated or excited the idea, that inhumanity may at times become praiseworthy and acceptable to the Deity. On the other hand, the opinion may prevail, that compassion is in itself a virtue, and, under that persuasion, individuals who are very solicitous of applause, or are extremely anxious to be pleased with themselves, may give it more of their regards than it ought to claim. "I make no doubt," says the Doctor, "that several, from this very motive, have exalted this principle as inconsiderately as others have vilified it. Every good man will agree, that this is the case when people consider it as either a veil for their vices, or an atonement for the neglect of their duty. For my own part, I am inclined to think, that those who are most ready to abuse it thus, are not the most remarkable for any exercise of it by which society can be profited." In reality, there does not seem to be any direct relation or proportion between the propensities, the sentiments, and the affections of human nature; so that it would be erroneous to infer, from the existence or prevalence of one, what may be the amount of another. A man shall have a great deal of benevolent feeling, under the influence of which, if it operated alone, and uncontrolled by other principles, he would hasten to the relief of an object in distress; and it is certain, that though the sufferings which he may chance to witness are calculated to give him uneasiness, or, as we say, wound his sensibility, nevertheless the emotion attendant on the desire to remove or alleviate them is in itself agreeable. To this may sometimes be added the grateful enough conviction, founded on experience, that the exercise of benevolence will produce a satisfaction in the mind fully remunerative of any trouble or sacrifice undergone in the way of duty, or in behalf of the sufferer. Still, the whole of this combined impulse and inducement may prove so far inoperative, owing to the excess of some other power, as to terminate merely in self-condemnation. With one man, the counter-agent is that peculiar affection or propensity which is commonly denominated avariciousness, or, restricting it to a special direction, the love of money, which, be it observed, is perfectly consistent with even a very high degree of the benevolent disposition. "Such a sermon as I heard to-day," said a certain individual to an acquaintance, "so powerful, so affecting, it positively made me shed tears." "I have no doubt of it," was the reply; "but it is easier to bring tears into your eyes than to draw a shilling from your pocket." This is a fair example of the case now abstractly considered. In another man, the opposing principle may be what is generally understood by the term pride, or what is sometimes called self-esteem, which, when excessive, may lead an individual to think he degraded himself by giving way to compassionate emotions, especially when their direct and immediate operation was to bring him in contact with beggary and wretchedness. There are who, when their pity is excited, would cheerfully give their money to the poor, had they an almoner that should relieve them from the drudgery of distributing it, though they are quite sensible that, by employing such aid, or doing good by proxy, they deny themselves a very considerable pleasure. A severe contest may take place in the minds of a third class, between the feelings of benevolence and the cravings of some of the lower propensities of human nature, which have been fostered by indulgence and gratification to such a degree as, in course of time, to assume, not only equality with, but superiority over the higher and nobler sentiments. The man who spends hundreds on his lusts, and not a farthing in the way of charity, may, notwithstanding, experience compassion and its accompanying desire in a measure perfectly annoying and inconvenient to his habits. It would be easy to enumerate other combinations and collisions. But these are sufficient for the present purpose of illustrating Dr Campbell's position. "So great is the anomaly which sometimes displays itself in human characters, that it is not impossible to find persons who are quickly made to cry at seeing a tragedy, or reading a romance, which they know to be fictitious, and yet are both inattentive and unfeeling in respect of the actual objects of compassion who live in their neighbourhood, and are daily under their eye." The emotions of benevolence, roused up by the appearance of suffering and distress, are the same, whether the exciting cause be a real scene in life, or a forcible representation, and this as given on the stage, in the pages of a book, or on the canvas of a painter; but whatever be their amount, or however instantaneous in occasioning both uneasiness and pleasure, or, at least, agreeable sensation, they may be favoured or checked, submitted to, or altogether subdued, by a variety of principles, which are either the natural product of the constitution or are superinduced by education and other circumstances. The application of this mode of reasoning to the solution of the question proposed for discussion, is so obvious, as to require merely to be suggested; and how intimate the connection is between this solution and the remarks formerly made on the correspondence of *the language of nature with the constitution of man*, will be shewn by a few extracts from one of Mr Hume's essays, not noticed by Dr Campbell, but which, from their comprehensiveness, cogency, and truth, will probably strike the reader as deserving to supersede all that we have now written on this interesting subject. As such, then, we shall with them conclude the present topic.

"It is needless to push our researches so far as to ask, why we have humanity, or a fellow-feeling with others? It is sufficient that this is experienced to be a principle of human nature. We must stop somewhere in our examination of causes; and there are, in every science, some general principles, beyond which we cannot hope to find any principle more general. No man is absolutely indifferent to the happiness and misery of others. The first has a natural tendency to give pleasure, the second pain. This every one may find in himself. It is not probable that these principles can be resolved into principles more *simple* and universal, whatever attempts may have been made to that purpose. But if it were possible, it belongs not to the present subject; and we may here safely consider these principles as original; happy, if we can render all the consequences sufficiently plain and perspicuous. Have we any difficulty to comprehend the force of humanity and benevolence? Or to conceive, that the very aspect of happiness, joy, prosperity, gives pleasure; that of pain, suffering, sorrow, communicates uneasiness? The human countenance, says Horace, borrows smiles or tears from the human countenance:

> "Uti ridentibus arrident, ita flentibus adflent
> Humani vultus."

Reduce a person to solitude, and he loses all enjoyment, except either of the sensual or speculative kind; and that because the movements of his heart are not forwarded by correspondent movements in his fellow-creatures. The signs of sorrow and mourning, *though arbitrary*, affect us with melancholy; but the *natural symptoms*, tears, and cries, and groans, never fail to insure compassion and uneasiness. In general, it is certain, that, wherever we go, whatever we reflect on or converse about, every thing still presents us with the view of human happiness or misery, and excites in our breast a sympathetic movement of pleasure or uneasiness. In our serious occupations, in our careless amusements, this principle still exerts its active energy. A man who enters the theatre is immediately struck with the view of so great a multitude participating of one common amusement, and experiences, from this very aspect, a superior sensibility or disposition of being affected with every sentiment which he shares with his fellow-creatures. He observes the actors to be animated by the appearance of a full audience, and raised to a degree of enthusiasm, which they cannot command in any solitary or calm moment. Every movement of the theatre, by a skilful poet, is communicated, as it were, by magic, to the spectators; who weep, tremble, resent, rejoice, and are inflamed with all the variety of passions which actuate the several personages of the drama. Where any event crosses our wishes, and interrupts the happiness of the favourite characters, we feel a sensible anxiety and concern; but where their sufferings proceed from the treachery, cruelty, or tyranny of an enemy, our breasts are affected with the liveliest resentment against the authors of these calamities. It is here esteemed contrary to the rules of art to represent any thing cool and indifferent. A distant friend, or a confidant, who has no immediate interest in the catastrophe, ought, if possible, to be avoided by the poet, as communicating a like indifference to the audience, and checking the progress of the passions. Few species of poetry are more entertaining than *pastoral;* and every one is sensible that the chief source of its pleasure arises from those images of a gentle and tender tranquillity, which it represents in its personages, and of which it communicates a like sentiment to the reader. Sannazarius, who transferred the scene to the sea-shore, though he presented the most magnificent object in nature, is confessed to have erred in his choice. The idea of toil, labour, and danger, suffered by the fishermen, is painful, by an unavoidable sympathy which attends every conception of human happiness or misery. "When I was at twenty, (says a French poet,) Ovid was my favourite: Now I am forty, I declare for Horace." We enter, to be sure, more readily into sentiments which resemble those we feel every day: but *no passion, when well represented, can be entirely indifferent to us, because there is none, of which every man has not, within him, at least the seeds and first principles.* It is the business of poetry to bring every affection near to us, by lively imagery and representation, and make it look like truth and reality; *a certain proof that, wherever that reality is found, our minds are disposed to be strongly affected by it.* Any recent event or piece of news, by which the fate of states, provinces, or many individuals is affected, is extremely interesting even to those whose welfare is not immediately engaged. Such intelligence is propagated with celerity, heard with avidity, and inquired into with attention and concern. The interest of society appears, on this occasion, to be, in some degree, the interest of each individual. The imagination is sure to be affected, though the passions may not always be so strong and steady as to have great influence on his conduct and behaviour. The perusal of a history seems a calm entertainment; but would be no entertainment at all, did not our hearts beat with correspondent movements to those which are described by the historian. The frivolousness of the subject, too, is not able to detain us entirely from what carries an image of human sentiment and affection. When a person stutters, and pronounces with difficulty, we even sympathize with this trivial uneasiness, and suffer for him. And it is a rule in criticism, that every combination of syllables or letters which give pain to the organs of speech in the recital, appears also, from a species of sympathy, harsh and disagreeable to the ear. Nay, when we run over a book with our eye, we are sensible of such inharmonious composition; because we still imagine that a person recites it to us, and suffers from the pronunciation of these jarring sounds; so delicate is our sympathy. Sympathy, we shall allow, is much fainter than our concern for ourselves, and sympathy with persons remote from us much fainter than that with persons near or contiguous; but, for this very reason, it is necessary for us, in our calm judgment and discourse concerning the characters of men, to neglect all those differences, and render our sentiments more public and social. Besides that we ourselves often change our situation in this particular, we every day meet with persons who are in a situation different from us, and who could never discourse with us, were we to remain constantly in that position and point of view which is peculiar to ourselves. The intercourse of sentiments, therefore, in society and conversation, makes us form some general unalterable standard, by which we may approve or disapprove of characters and manners. And though the heart takes not part entirely with those general notions, nor regulates all its love and hatred by the universal abstract differences of vice and virtue, without regard to self or the persons with whom we are more intimately connected, yet have these moral differences a considerable influence, and being sufficient, at least, for discourse, serve all our purposes in company, in the pulpit, in the theatre, and in the school."—(An Enquiry concerning the Principles of Morals, Section 5. "*Why utility pleases.*")

It is not intended to pursue the fundamental principle of the essay now quoted into all its consequences and applications, nor by any means to adopt it as the tenor of a system by which all that is excellent in art, in science, and in morals, can be accounted for and extended; but, it is easy to deduce, from even the very incomplete view of it which a few extracts can present, some if not all of the distinctions which ought to be maintained between various species of poetry, considered as the emanation and the representative of the language of nature. If the objects of these various species be in any measure alike, there is nevertheless an obvious and well marked difference in the means by which they are endeavoured to be accomplished, and the amount and kind of this difference must be distinctly and perpetually recognized by the poet. Here, then, as an example, may be offered a brief statement of certain characteristic peculiarities in the construction of works intended for the stage and others, which, whether under a dramatic form, or purely epic in mechanism and appearance, are confined exclusively to the closet.

The two highest branches of poetry, and, laying aside for the present all regard to the specimens of poetry found in the Holy Scriptures, which may be conceived to form a separate class, we claim this rank for tragedy and the epopee, agree in requiring, for their very existence and operation, personages, events, and situations intrinsically or incidentally above the common average of every-day life. The characters must be remarkable for natural or superinduced qualities, for rank, station, achievements, or what are generally denominated fortune and fate, under which are comprehended both sufferings and enjoyments, whether of mind or circumstances,—in short every thing which enters into the history of an individual, and gives it prominency and interest. In like manner the events which befal them, and the situations in which they are placed, must seem to justify the demand made on the sympathy and attention of those to whom they are exhibited, and exhibited, be it remarked, for the express purpose of calling forth a more than usual portion of feeling and sentiment, whatever that feeling and sentiment may be. The choice of a subject, then, it may be said with equal truth of both a tragic and an epic poem, must be determined by the same general principles; and, for a similar reason, the management and progress of the poet in both must bear unequivocally, throughout, on the condition and career of the human beings who give vitality and the power of influencing to the respective productions. One great distinction between the two species, and which is conspicuous in their very form, as it is the necessary result of their essential difference, is the mode by which their pointing, or the relation of the whole to the history and fortunes of the personages brought forward, is effected. In the drama, the characters are actually seen and heard to act and to speak, to do and to suffer, precisely as they are known or believed to "live, move, and have their being," in the scenes and circumstances represented; and, if not actually before us on the stage, *in vera effigie*, something belonging to them, or a certain arrangement of material objects, for the moment understood and contemplated in subserviency and relation to them, preserves the consciousness and persuasion of their virtual existence in the mind and sensibility of the spectator. When the curtain drops, however highly we may have been excited during the performance, and whatever impression may remain, or discussion be entered into, as to the merits of particular parts and particular actors, the piece is to all intents and purposes clearly at an end, and by no effort of the most retentive and correct memory, aided as it may be by reference to what we call a copy of the work, can be reinstated in substance as embodied before us. The only possible revival of which it is capable, we may say without a pun, is its *representation*. As the appearances, the behaviour, and the language of the personages exhibited to our senses of hearing and vision, operate upon our internal faculties in all respects as if the constituent beings, and not their representatives, displayed them, we do not need the intervention of any narrator, or other external and foreign agent, employing merely arbitrary signs or conventional terms, to prompt our feelings and direct the current of our thoughts, or give us an imaginary position and presence in the localities and amid the entities, not described simply, but positively so depicted as to have the influence of reality. The case of the epic poet is widely different, and this for reasons which it would only be loss of time, if not an insult to the reader, to detail. Be it mentioned only, that he has nothing to avail himself of, no legitimate instrument by which to awaken emotion or communicate ideas of any kind, save a system and an arrangement of signs, in themselves unmeaning, liable to much misconception and misrepresentation, deriving all their efficacy from the uses to which communities of mankind have agreed and been made by education and slowly acquired habits to put them, and by the very medium through which they are transmitted to the intellectual functions excluding all succour from those agents which directly move the affections. It is evident from what has here been said, that the dramatist must direct his chief attention to the *acting* of his characters, their appearance on the stage with a frequency proportioned to their consequence, and in circumstances calculated at once to develope their energies whether in doing or suffering, and to call forth corresponding emotions on the part of the audience. He himself has no existence in the piece, and ought not to have any substitute or representative, as all the personages he brings forward must be considered principals in themselves, whatever may be their subordination and affinity relative to the plot and to each other.

To the wished for effect of an acted drama, it is, generally speaking, required that the characters be a good deal varied, or that there be strong contending passions in some of them, particularly the chief. It follows, almost of necessity, that the incidents must be greatly diversified, and the situations strikingly contrasted. As to the sentiments and dialogue, it is enough for our purpose to observe, that consistency, distinctness, individuality, or pointedness, are the essential excellencies of the former; and that in the latter, besides the due regard to well established proprieties, modified in certain cases so as to harmonize with the characters depicted, the dramatic writer ought not to indulge himself in irrelevant declamation, superfluous imagery, and episodic beauties. These may be all excellent in themselves, and perfectly suitable to another species of composition; but here even good poetry may be greatly misplaced, and it assuredly is so if it interfere with the attention of the audience to the train of incidents, or disturb the emotions that are excited by the passions and conduct of the characters. Such, in few words, are some of the circumstances of most consequence to the constitution and success of a tragedy, judged of at least according to the standard of our own country. But it must be admitted that the tastes of different ages and people are not a little varied on the subject. In the ancient Greek tragedy, it seems to have been an established principle that the plot or fable should consist of one event, of a simple and easily developed nature, but, at the same time, important, and calculated to touch the feelings or rouse up a sense of interest; and this event, from its very essence, required only a few agents, who delivered themselves, almost uniformly, in a stately, or what we should call a formal manner, their language being correctly measured and adjusted to certain prosodial rules; and in order, probably, to relieve the monotony thus occasioned, as well as to allow of explanations and reflections, it was usual to introduce what is denominated a *chorus*, which generally consisted of personages distinct from those of the tragedy to which it belonged, and whose duty it was both to sing and to dance for the entertainment of the audience. The writers of those classical productions commonly employed very obvious means in carrying on the story which they undertook to represent. Accordingly we find them abounding in statements and details which we moderns, especially in Britain, are apt to think too minute and plain to afford scope for the imaginations of an audience, and on the whole wearisome and dull. The interest of the piece, moreover, was endeavoured to be kept up by the sentiments and language of the characters, much more than by the incidents to which they were subjected; and hence the frequency of reflections, what we stile moralizings and exclamations, in the Greek tragedies; though these, it ought to be observed, besides being admirable in themselves as specimens of perfectly natural, unpretending, chaste, but yet declamatory composition, are often judiciously interspersed with brief remarks and pointed sentences, which both relieve the ear and inform the mind as to the import and business of the story. This is the general character of these remarkable productions, as borne out by the comparatively few specimens which have reached our times; but even in these we discover the peculiarities of individual writers, so that we are perhaps at liberty to conclude that, in former times, as now, the genius of a poet did not hold itself altogether amenable to any common standard. This will be made apparent by the slightest examination of the works of that illustrious trio to whom we must look as the representatives of the Greek tragedians, Æschylus, Sophocles, and Euripides.

Of each of the first and second of these poets, we possess seven performances, not the whole that were written by them, bnt admitted by the most ancient critics themselves to display their highest characteristic excellence; and of the last there remains 19 out of more than 70 productions, a circumstance at once to his advantage and his disadvantage, as judged of in comparison with his rivals. Before proceeding to notice these authors more particularly, it is proper to guard the reader against the common, though glaring mistake, of considering the Greek tragedies in relation to the structure and management of a modern theatre. It is impossible to do them justice, or even to comprehend how the peculiar efficiency ascribed to them was accomplished, if we conceive them as brought forth on our own stage. This is well stated by a recent writer, Schlegel, in his Lectures on Dramatic Literature. "When we hear the word theatre, (says he,) we naturally think of what with us bears the same name; and yet nothing can be more different from our theatre than the Grecian, in every part of its construction. If, in reading the Greek pieces, we associate our own stage with theirs, the light in which we shall view them must be false in every respect. The theatres of the Greeks were quite open above, and their dramas were always acted in open day and beneath the canopy of heaven. The Romans, at an after period, endeavoured by a covering to shelter the audience from the rays of the sun; but this degree of covering was hardly ever enjoyed by the Greeks. Such a state of things appears very inconvenient to us; but the Greeks had nothing of effeminacy about them, and we must not forget, too, the beauty of their climate. When they were overtaken by a storm or a shower, the play was of course interrupted; and they would much rather expose themselves to an accidental inconvenience, than, by shutting themselves up in a close and crowded house, entirely destroy the serenity of a religious solemnity, which their plays certainly were. To have covered in the scene itself, and imprisoned gods and heroes in dark and gloomy apartments, imperfectly lighted up, would have appeared still more ridiculous to them. An action which so nobly served to establish the belief of the relation with heaven could only be exhibited under an unobstructed sky, and under the very eye of the gods, as it were, for whom, according to Seneca, the sight of a brave man struggling with adversity is an attractive sight. The theatres of the ancients were, in comparison with the small scale of ours, of a colossal magnitude, partly for the sake of containing the whole of the people, with the concourse of the strangers who flocked to the festivals, and partly to correspond with the majesty of the dramas represented in them, which required to be seen at a respectful distance."

To Æschylus, notwithstanding all the faults imputed to him, must be allowed the honour of introducing some of the greatest improvements ever made in the tragic art. Before his time there was no public theatre, the actors being content to stroll about and exhibit their talents of mimickry and gesticulation in a vehicle, which, in all probability, could not have borne comparison with one of our mountebank scaffoldings, or a travelling showman's establishment. He gave masques to his actors, an innovation which we should deem no advantage, but which certainly was such at the time, furnished them with apparel suitable to the characters they had to represent, and otherwise consulted the dignity and effectiveness of their appearance. But not to dwell on minor or merely operative merits, which, however, were sufficiently great and numerous to entitle him to be considered, to use the language of Schlegel, "as the creator of tragedy, which sprang from him completely armed, like Pallas from the head of Jupiter," let us regard him as a poet. It seems that, in this early period, the stronger passions were reckoned most proper to tragedy, and that one of the great objects of the dramatist was to excite terror. Here Æschylus excelled, and seems to have found ample scope for the impetus of his own mind. He rarely concerns himself with the tender affections, but is, almost throughout, serious, urgent, vehement, sublime, or awful. His stories are extremely simple and easy to be understood, however difficult the language used by him; and his characters have few features, but these are strongly drawn, and therefore highly discriminative. In point of language, he is always lofty and full-toned, apt to exaggerate and wander into obscurities, if not absurdities; fond, to excess, of figures and declamatory imagery, and seemingly resolved that no thought which ever occurred to his mind, however plain or trivial it might be, should be allowed to betray the simplicity of its nature by a corresponding attire, or to spoil, by a piebald contrast, the general pompousness of his diction. Dryden says of him, that he never wrote "in cold blood," and that he was always "in a rapture and in a fury with his audience." Rapin remarks, that he "is sublime and lofty to an extravagance; never speaks coolly and calmly; says the most indifferent things in a tragic tone; and that, in the portraits he draws, the colours are too glaring, and the strokes too rude." Harwood expresses his opinion of him in these words. "Our countryman, Lee, of frantic memory, may, with propriety, be termed the English Æschylus. They were kindred spirits, and, I dare say, are inseparable in the Elysian fields. The English reader, who has read of Lee's gods meeting gods, and jostling in the dark, may form some idea of the extravagant ideas and sonorous diction of Æschylus." Such was his power in the terrible, in which he seems to have delighted, that when his Epimenides appeared on the stage, and he introduced the furies as a chorus, the audience were affected in an extraordinary degree, children falling into fits, and pregnant women miscarrying. A good idea of the simplicity aimed at by this poet, in the construction of his tragedies, may be derived from the Chained Prometheus, though this, it must admitted, is probably the most simple of all his productions, as it is likewise the most remarkable for grandeur. It does not comprehend a series of actions, but rather displays a succession of thoughts and mental abstractions. Fixed to a rock, Prometheus holds converse with the primitive and most venerable powers in nature, ideal existences, or creatures of even earlier antiquity than the bulk of the heathen deities. "Prometheus," (says Schlegel, who has fairly appreciated the merit of Æschylus, "is an image of human nature itself; endowed with a miserable foresight, and bound down to a miserable existence, without an ally, and with nothing to oppose to the combined and inexorable power of nature but an unshaken will and the consciousness of elevated claims. The other pieces of the Greek tragedians are single tragedies; but this may be called tragedy itself; its purest spirit is revealed, with all the overpowering influence of its first unmitigated austerity." But notwithstanding this opinion, and the rank assigned him, it may be safely asserted, that the genius of Æschylus is fully more that of an epic poet than of a dramatist; and this might be made to appear were an analysis given of all of his works which have reached our times, were this a fitting time to enter on it.

If Æschylus improved the Greek tragedy, Sophocles must be allowed to have carried it to the highest degree of perfection of which it was capable; and he is accordingly, with some justice, entitled by Mr Franklin, who has translated him, the prince of ancient dramatic poets. A similar opinion is maintained by Dryden, who conceives his Œdipus to be the most deservedly celebrated tragic piece of which antiquity can boast. In comparing him with Æschylus, in one particular, Schlegel expresses himself in terms which may be allowed to afford a correct notion of his peculiarities. "In Æschylus," says he, speaking of the Œdipus Coloneus, "before the victims of persecution can be saved, the hellish horror of the furies must congeal the blood of the spectator, and make his hair stand on end; and the whole rancour of these goddesses of rage must be exhausted. The transition to their peaceful retreat is, therefore, the more astonishing. It seems as if the whole human race were redeemed from their power. In Sophocles, however, they do not even once make their appearance, but are altogether kept in the back-ground, and they are not called by their proper names, but made known to us by descriptions in which they are a good deal spared. But even this obscurity and distance, so suitable to those daughters of night, is calculated to excite in us a still dread, in which the bodily senses have no part. The clothing of the grot of the fairies with all the charms of a southern spring, completes the sweetness of the poem; and were I to select an emblem of the poetry of Sophocles from his tragedies, I should describe it as a sacred grove of the dark goddesses of fate, in which the laurel, the olive, and the vine display their luxuriant vegetation, and the song of the nightingale is for ever heard."

The fables of those tragedies of Sophocles which remain are judiciously chosen, and appear to be managed with due regard to the excitement of interest in an audience; the incidents he introduces, and the situations in which he places his characters, are natural and probable; he displays great elegance and refinement in his sentiments and reflections, which seem to flow from a well tempered judgment and experience of the world; and in point of diction, whether considered in relation to the choice of language or the music of verse, he is generally correct and sensible, frequently lofty and sublime, and always harmonious. Still, with all these and other merits, his pieces can hardly be deemed tragedies, if tried by the opinions and taste of our country. They are defective in what we reckon the very essence of the style. His characters have a marble-like stiffness about them, a stoical superiority above the misfortunes of life, an indifference in the midst of suffering, or a cold-bloodedness in the perpetration of crimes, and, above all things, a perpetual practical submissiveness to the decrees of fate or the power of the gods, which restrains them from electric bursts of passion, the abandonment of soul and feeling requisite to the expression of the highest and most influential eloquence, and in short makes them rather objects to be admired or wondered at, like some of the fine figures of ancient sculpture, than beings in whose trials and actions we have any sympathetic communion. The objections made to him by Rapin are of another kind, and scarcely merit attention here, because they do not affect the principle on which this criticism is hazarded. He thinks the art of the poet is not sufficiently contrived, that the affectation of sublimity has sometimes rendered him obscure, and that the loftiness of his expressions is somewhat injurious to their perspicuity. On the other hand, it is fair to give him the weight of the testimony of Schlegel, in whose partiality for Sophocles we have a striking example of the difference of sentiment, on the subject of tragedy, which exists between some of our continental neighbours and ourselves. "The lovers of the affected sentimentality of the present day would, both in the representation of bodily sufferings and in the language and economy of the tragedies of Sophocles, find much of an insupportable austerity. But the whole of his tragedies are conspicuous for their separate excellences. In Antigone, we have the purest display of female heroism:

in Ajax, the manly feeling of honour in its whole force; in the Trachiniæ, the female levity of Dejanira is beautifully atoned for by her death; and the sufferings of Hercules are pourtrayed with suitable dignity. Electra is distinguished for energy and pathos; in Œdipus Coloneus there prevails the mildest emotion, and over the whole piece there is diffused the utmost sweetness." We have probably the reason of this critic's partial judgment assigned in the sentence which immediately follows, and it is one which is too limited in its nature to warrant a general conclusion on the question of tragic excellence. "I will not undertake, (continues Schlegel,) to weigh the respective merits of these pieces against each other; but I am free to confess, that I entertain a singular predilection for the last of them, as it appears to me *the most expressive of the personal feelings of the poet himself*." This is no doubt a very legitimate source of curiosity and satisfaction or sympathy; but it cannot be allowed as an element in the production of dramatic effect. The contest as to the relative claims of Euripides and Sophocles, which has occupied the critics in all ages since the revival of letters, as well as among the ancients themselves, can never be terminated while the standards to which they are made amenable are various. Nor is it of any consequence that it should, so long as their respective qualities can be pointed out, and must of necessity always find admirers and advocates from the different classes of readers who venture on the discussion. The only absurdity that can be committed is that of undervaluing what the constitution of one's mind does not enable him justly to appreciate; and this absurdity, it seems pretty certain, is that into which Schlegel, for example, has fallen with respect to Euripides. It may be fairly enough conceded to him, that this poet is not to be compared with his great rival. But the inference is not necessarily logical, that he is inferior on the whole, or in the abstract; because it is obvious, that they may have little in common to admit of their being compared together. Though this, to be sure, is not the case, the illiberality of judgment on the part of the German critic may be, nevertheless, made very apparent; and it would not be risking much to assert that, in many respects, the tragic character of Euripides rises above that of Sophocles. The high regard entertained for his works by the great master of Roman eloquence, who, besides his written commendation of him, was found perusing one of his pieces, namely, the Medea, when he was overtaken in his litter by his assassins, may be quoted as the decision of a very competent critic; but this, it may be said, is liable to be construed as an evidence of the poet having rather mistaken the bent of his genius, and manifested more of the talent of an orator than of that spirit which is required for tragic purposes. There is some weight in the objection, admitting that, though their design be the same, their objects, or, to speak more correctly, the means by which these are attained, are different. Not to dwell on this implied eulogium, then, it will be enough for most English readers to specify a single particular in which Euripides excels,—and it is precisely that very one for his defect in which we have not hesitated to censure Sophocles,—a freedom, or, if the expression be proper, a candour, in the delineation of suffering, unmitigated and unchecked by any philosophical reasonings, and a fluency and readiness in uttering the language of the heart, which, though it may seem to impair the dignity of his characters, brings them distinctly within the range of our sympathies. This peculiarity is noticed by one of his admirers, in a single sentence: "In raising the passions, he is universally admirable; but in exciting compassion inimitable." It would be wrong, however, to deny, that, in this very particular, he might have been equalled by Sophocles, had the latter suffered himself to exercise what there is every reason to believe he experienced in no less degree. For, in point of fact, there is no defect of feelings in the tragedies of Sophocles; but he was at perpetual and successful pains to varnish them over by some extraordinary mental effort on the part of his ideal creatures. This is so constant as to be evidently systematic; but, though it implies great force of mind, it must fail of producing popular effect, and can only be appreciated by those who are possessed of an uncommon degree, or rather a peculiar species, of discernment.

Not to dwell longer on this topic, or farther to particularise the qualities and defects of the Greek tragedians, it is to be observed, that two great nations of modern times have indicated the differences of their characters in the nature of such of their respective tragic compositions as have obtained popular applause and adoption among them. The ingenious writer in the Edinburgh Review, who has criticised Miss Baillie's attempt to reconcile these national discrepancies of taste, has placed this matter in a clear light. "There are two sorts of dramatic composition, or at least of tragedy, known in this country,—one, the old classical tragedy of the Grecian stage, modernized, according to the French or Continental mode;—the other, the bold, free, irregular, and miscellaneous drama of our own older writers, or, to speak it more shortly or intelligibly, of Shakspeare. The chief variations of the former, (besides the extinction of the chorus,) seem to be, first, that love has been made to supplant almost all the other passions, and the tone, accordingly, has become less solemn and severe; secondly, that there is less simple narrative and inquiry, and a great deal more argument or debate,--every considerable scene, in fact, being now required to contain a complete and elaborate discussion, to which all the parties must come fully prepared to maintain their respective theses; and, thirdly, that the topics are drawn, in general, from more extended and philosophical views of human nature, and the state of the feelings set forth with more rhetorical amplification, and with a more anxious and copious minuteness. Notwithstanding those very important distinctions, however, we think ourselves justified in arranging the tragic drama of ancient Greece, and that of the continent of modern Europe, as productions of the same school; because they will be found to agree in their main and characteristic attributes,—because they both require the style and tone to be uniformly grave, lofty, and elaborate,—the fable to be simple and direct,—and the subject represented to be weighty and important. Neither of them, consequently, admits of those minute touches of character which give life and individuality to such delineations; and the interest, in both, rests either on the greatness of the action, and the general propriety and congruity of the sentiments by which it is accompanied, or on the beauty and completeness of the discussion, the poetical graces, the purity and elevation of the language, and the accumulation of bright thoughts and happy expressions which are brought to bear on the same subject. Such is the idea of dramatic excellence that prevails over the continent of Europe, and such the chief elements which are there admitted to compose it. In this country, however, we are fortunate enough to have a drama of a different description,—a drama which aims at a more exact imitation of nature, and admits of an appeal to a far greater variety of emotions,—which requires less dignity or grandeur in its incidents, but deals them out with infinitely greater complication and profusion,--which peoples its busy scenes with innumerable characters, and varies its style as freely as it multiplies its persons —which frequently remits the main action, and never exhausts any matter of controversy or discussion,—indulges in flights of poetry too lofty for sober interlocutors, and sinks into occasional familiarities too homely for lofty representation,—but, still pursuing nature and truth of character and of passion, is perpetually setting before us the express image of individuals whose reality it seems impossible to question, and the thrilling echo of emotions in which we are compelled to sympathise. In illustration of this style, it would be mere pedantry to refer to any other name than that of Shakspeare, who has undoubtedly furnished the most perfect as well as the most popular examples of its excellence, and who will be found to owe much of his unrivalled power over the attention, the imagination, and the feelings of his readers, to the rich variety of his incidents and images, and to the inimitable truth and minuteness of his crowded characters. Nothing, then, it appears, can be more radically different than the modern French and the old English tragedy. The one is the offspring of genius and original observation,—the other of judgment and skill. The one aims at pleasing chiefly by a faithful representation of nature, and character, and passion,—the other by a display of poetical and elaborate beauties. The style of the latter, therefore, requires a continual elevation, and its characters a certain dignified uniformity, which are necessarily rejected by the former,—while our old English drama derives no small share of its interest from the rapidity and profusion of the incidents, and the multitude of the persons and images which it brings before the fancy; all which are excluded from the more solemn and artificial stage of our continental neighbours." In few words, foreign writers for the drama seem to treat tragedy more as an epic poem than as an exhibition of passion, and their practice is conformable to this idea. They are more circumspect in regard to the language of their productions, the regularity, probability, and concinnity of their stories, and are careful to preserve a tone of dignity and a stateliness of air through all the departments of their fable, their incidents, reflections, imagery, and diction. We, on the other hand, less scrupulous about the purity of the agents which move us strongly, look for genuineness of passion and concordance with nature, in whatever manner the former may display itself, and into whatever scenes the latter may conduct us. The consequence is, our neighbours produce finer poems, we the more efficient representations. They can appeal, with confidence, to classical authority for a commendation of their labour to elevate tragedy above the sphere of ordinary usages and common life, and are sure never to give offence to the most polished circles in Europe; we claim the suffrages of the human heart, in all ages and countries, and practically assert the supremacy of its energetic movements over all the formalities and prudery of artificial society.

It would not be difficult to apply the general principles which we have endeavoured to discover in the language of nature to the essential parts of other compositions in *poetry*, taken in its large and philosophical sense, and also to the main constituents of what is denominated *oratory* or *rhetoric*. The reader will have perceived the intimate connection that exists between these two subjects, that they are branches of one tree, partaking of a common nourishment, yielding the same fruit, and differing solely in the direction in which they grow and the uses to which they are devoted. In the one, as well as in the other, the object must always be to move the passions, understanding thereby those internal affections from which all our actions and practical decisions take their rise; and, accordingly, with perfect propriety, Quintilian, one of the greatest teachers of oratory, deems the skill required to engage the passions *the soul and spirit of the art*. With the peculiarities of either, those divisions into various kinds, the technicalities and rules which relate to their mechanism and practice, we are not at present occupied. In so far as these are connected with arbitrary language, they obviously belong to another department of the essay; and to give them all the respect to which their real utility entitles them, it would be proper to treat of them as of some other kindred topics under the head of LOGIC, taken in a sense far more extensive and important than when it is held to designate the scholastic art of disputation. Here, then, we mean to terminate our remarks on the first part of our subject, that which relates to natural language; but we cannot do so, without availing ourselves of some general reflections on the various topics alluded to, which, from their own weight, merit serious regard, but to which we naturally solicit more especial attention from the very circumstance of their harmonizing with the sentiments which we ourselves have either expressed or implied. They are abridged from Dr Campbell's introduction to the work formerly quoted; and, in giving them, it may be observed, once for all, that some of the terms used require to be taken in a qualified sense.

Art is founded in science, and the science is not to be valued which does not lead to some useful art. This is true of all the arts and sciences, whether useful or merely elegant; for valuable knowledge alway leads to some practical skill, and is perfected in it; and practical skill must be much limited which has not its origin in knowledge. It is no doubt very possible, by example and imitation, to make some progress in an art, without possessing the principles on which it is founded; and in almost every art there are certain rules an adherence to which may, and often does, serve as a substitute for the knowledge of these principles; but their efficacy is extremely limited, and even these could not have been established had not some knowledge preceded them. This is particularly the case with those arts which are derived from abstract and universal axioms, like the various branches of pure mathematics; but even in those which are founded on experiment and observation, when we advance progressively from the individual to the species, thence to the genus, and to the most extensive orders and classes, we, at last, arrive at some general principles which answer the purpose of science; and, thenceforward, we are enabled accordingly to determine, in a great variety of cases, the success of new applications. The arts styled liberal are no exception; for though in them a good deal of manual labour is required, yet do they furnish occasion for the enlargement of the mind, and the attainment of general views. It is the end or design of an art which determines its title as useful or as elegant; as it is the nature of the means employed in it which constitutes it mechanical or liberal. Thus some arts are evidently intended for profit or utility, that is, to supply a real want or accomplish a certain good, as others are calculated to please or gratify a mental taste. But even in the former there is generally some opportunity afforded for the display of beauty or elegance; and the latter are far indeed from being utterly useless. The character of both, accordingly, is to be decided by their direct and avowed purpose, and not by what they may incidentally permit or accomplish. Under the class of the elegant arts, those of the painter, the statuary, the musician, and the poet, are comprehended by Dr Campbell; and he considers the arts of oratory and architecture as of a mixed nature, wherein utility and beauty have almost equal influence. It will afterwards appear from his own words, that poetry and oratory ought not to be disjoined; and perhaps it would not be difficult to prove, were it necessary, that there is no occasion for separating architecture from the rest. But this is merely a casual remark, and of no consequence in the argument. The elegant arts are of later origin than the useful, but of quicker growth, and sooner attain a degree of perfection, beyond which it is merely impossible, in the nature of things, that they should ever proceed. Their limits can almost certainly all be defined; and accordingly, in some of them, it is well known, the productions of very early times remain the models which succeeding artists rather endeavour to imitate than hope to excel. But though they sooner arrive at a high degree of excellence, the acquisition of perfection in any one of them, up to the standard at the time, is more difficult than that of any of the useful arts, and requires a happy combination of original powers, which is the endowment of comparatively few who engage in the labour. Moreover, as the gratification of taste is the immediate object of the fine arts, their effect is instantaneous, and the quality of any new production in them is readily judged of by the bulk of mankind, all of whom have some of the rudiments of taste, or some internal faculties to which such productions are addressed. Now, as the end of those arts which, like poetry, are purely elegant, is to be attained by an accommodation to some internal taste, "so the springs by which alone they can be regulated must be sought for in the nature of the human mind, and more especially in the principle of the imagination. It is also in the human mind that we must investigate the source of some of the useful arts. Logic, whose end is the discovery of truth, is founded in the doctrine of the understanding; and others, (under which may be comprehended economics, politics, and jurisprudence,) are founded in that of the will. But these are not the only arts which have their foundation in the existence of human nature. Grammar, too, in its general principles, has a close connexion with the understanding and the theory of the association of ideas." In some of the expressions here employed by Dr Campbell, the reader will recognize an adoption of a certain metaphysical system, very prevalent in his day, and of which, indeed, he was one of the most able expounders. But without stopping to inquire into their correctness, as judged of by any other system, it is believed that they will be so generally understood as not to demand any specific interpretation. They are thus alluded to merely to guard against the mistake of supposing that the introduction of them in any way commits the writer's opinions on the subject of the theory by which they have been appropriated. "But there is no art whatever," continues Dr C. "that hath so close a connexion with all the faculties and powers of the mind as eloquence, or the art of speaking, in the extensive sense in which I employ the term. For, in the first place, that it ought to be ranked among the polite or fine arts, is manifest from this, that in all its exertions, with little or no exception, it requires the aid of the imagination; whereby it not only pleases, but by pleasing commands attention, rouses the passions and often at last subdues the most stubborn resolution. It is also a useful art. This is certainly the case if the power of speech be a useful faculty, as it professedly teaches us how to employ that faculty with the greatest probability of success. Further, if the logical art and the ethical be useful, eloquence is useful, as it instructs us how these arts must be applied for the conviction and the persuasion of others. It is indeed the grand art of communication, not of ideas only, but of sentiments, passions, dispositions, and purposes. Nay, without this, the greatest talents, even wisdom itself, lose much of their lustre, and still more of their usefulness. *The wise in heart,* saith Solomon, *shall be called prudent, but the sweetness of the lips encreaseth learning.* By the former a man's own conduct may be well regulated, but the latter is absolutely necessary for diffusing valuable knowledge, and enforcing right rules of action upon others. Poetry indeed is properly no other than a particular mode or form of certain branches of oratory. The direct end of the former, whether to delight the fancy, as in epic, or to move the passions, as in tragedy, is avowedly in part the aim, and sometimes the immediate and proposed aim, of the

Natural Language.

orator. The same medium language is made use of, the same general rules of composition, in narration, description, argumentation, are observed; and the same tropes and figures, either for beautifying or for invigorating the diction, are employed by both. In regard to versification, it is more to be considered as an appendage than as a constituent of poetry. In this lies what may be called the more mechanical part of the poet's work, being at most but a sort of garnishing, and by far too unessential to give a designation to the kind. This particularity or form, to adopt an expression of the naturalists, constitutes only a variety, and not a different species." And what he afterwards delivers on oratory will be found equally applicable to all the other arts in which language is the primary agent, and which have for their aim the excitation of the passions or affections of mankind, whether these are to terminate in the mind itself, or to induce the individual to adopt a corresponding conduct. "When we consider the manner in which the rhetorical art hath arisen, or been treated in the schools, we must be sensible, that in this, as in the imitative arts, the first handle has been given to criticisms by actual performances in the art. The principles of our nature will, without the aid of any previous and formal instruction, sufficiently account for the first attempt. As speakers existed before grammarians, reasoners before logicians, so doubtless there were orators before there were rhetoricians, and poets before critics. The first impulse towards the attainment of every art is from nature. The easiest assistance or direction that can be obtained in the rhetorical art, by which men operate on the minds of others, arises from the consciousnes a man has of what operates on his own mind, aided by the sympathetic feelings, and by the practical experience of mankind, which individuals, even in the rudest states of society, are capable of acquiring. The next step is, to observe and discriminate, by proper appellations, the different attempts, whether modes of arguing, or forms of speech, that have been employed for the purposes of explaining, convincing, pleasing, moving, and persuading. Here we have the beginning of the critical science. The third step is, to compare, with diligence, the various effects, favourable or unfavourable, of those attempts, carefully taking into consideration every attendant circumstance by which the senses appear to have been influenced, and by which we may be enabled to discover to what particular purpose such attempt is adapted, and in what circumstances it is to be used. The fourth and last is, to canvass those principles in our own nature to which the various attempts are adapted, and by which, in every instance, their success, or want of success, may be accounted for. By the first step, the critic is supplied with materials. By the second, the materials are distributed and classed, the forms of argument, the tropes and figures of speech, with their divisions and subdivisions, are explained. By the third, the rules of composition are discovered, or the method of combining and disposing the several materials, so as that they may be perfectly adapted to the end in view. By the fourth, we arrive at that knowledge of human nature, which, besides its other advantages, adds both weight and evidence to all precedent discoveries and rules."

Representative Language.

2. Representative Language is almost entirely confined to mankind, and relates to the use of imitative gesture, statuary and pictorial delineations, and other similitudinous insignia. The first of these may be reckoned the connecting link between natural and representative language. It is well illustrated in what is called *pantomime*, where various events and circumstances are attempted to be described by certain actions, which, though not strictly natural, may be understood by those who have ever witnessed and can remember like occurrences. The difference between such actions and those which result spontaneously from internal feeling, is quite a good, and indeed an obvious one. In the latter case, there needs no experience on the part of the observer in order to the due interpretation of the language, as he immediately ascertains its import by the impressions made on his own mind, or the corresponding feelings excited in him; but, in the former case, he has to reflect on what he has *seen* before he can discover the object of the imitation. For example, a mimic wishes to inform us, by representative language, that a certain person is asleep. Having indicated him by some significant allusion to his personal, official, or incidental peculiarities, he reclines his head, lays his open hand immediately below it, and closes his eyes. These actions are perfectly descriptive, but never could have been understood by those who had not experienced what sleep is, and noticed both the usual preparations for it and the mode in which it operates. In like manner, to express satisfaction in eating, or the grateful sense arising from plentiful refection, the buffoon smacks his lips, strokes his doublet, and by the particular movement of his hands over his belly indicates its extension. These are simple examples, and many more might be adduced; but there are probably few readers who will not be aware that much more complicated facts may be delineated by similar means, and that even very interesting stories may be told by representative actions alone.

It does not appear, that what we call pantomimes, or dramatic entertainments consisting of representations by dumb-show, were known by the ancient Greeks; and the opinion is commonly held, that they were introduced among the Romans about the time of Augustus, if not by that monarch himself, though Salmasius has thrown out hints which render it probable that they were of earlier date. The term *mimic* was certainly in use before that period, but was applied to a performer who both spoke and acted. We find frequent allusions to the pantomimes in Juvenal, which has induced Mr Gifford, in his notes on that author, to enter somewhat amusingly on the history of their rise, progress, and disappearance; and Bayle, in his Dictionary, under the word Bathyllus has some remarks on the subject, of which the curiosity is such as to justify a short notice. Before the age of Augustus, the Romans possessed no other intermediate amusements than mimics and farces of a low and desultory kind, in which buffoons, chiefly from Tuscany, were the performers, who were brought upon the stage between the acts of the regular dramas, when they exercised themselves in coarse ribaldry, and the most ridiculous gestures. A change was effected by Pylades and Bathyllus, the former of whom was brought from Cilesia to Rome by orders of Mæcenas, who had seen him dance there, and the latter was one of the slaves of that minister. These two men planned a new entertainment, which obtained the approbation of the emperor, and soon became fashionable. It consisted in action alone, was exhibited in a magnificent theatre built for the purpose, and was accompanied by so much better an orchestra than had yet been known in Rome, as, in addition to its novelty and intrinsic merits, soon enabled it to take the lead as a public amusement, to the prejudice of both the tragic and the comic dramas. The art thus patronized was probably advanced to its highest perfection by the very individuals in whose ingenuity and dexterity it had originated; for it does not appear that their followers either increased the splendour of the scene in which it was displayed, or improved on the skilful movements of its first performers. The attachment of the Roman people to this species of amusement became so excessive as to constitute a kind of passion, and to engross almost the whole of their time and attention. The emperor himself regarded it, or affected to regard it, with extraordinary pleasure, and conferred sundry privileges and favours on its professors. Pantomimes were exempted from the operation of the old law, by which magistrates could inflict corporal punishment on mimics and players; and were allowed to aspire after honours from which their less esteemed brethren of the stage were debarred. The consequences of such peculiar protection and encouragement were very natural and very usual; insolence in the performers, and parties among the people. Pylades and Bathyllus were rivals for public applause. The former excelled in tragic, and the latter in comic subjects. Disputes on their respective merits assumed all the seriousness of a question in politics; and, as they at length disturbed the state, Augustus interfered to restore tranquillity by banishing one of the causes. But the effect was not what he wished. In the absence of Pylades, the people felt a considerable abatement in their pleasure, and expressed their dissatisfaction by clamours for his recal, to which it was thought advisable to yield. The death of Bathyllus left that actor without a competitor, and, as he seems to have imagined, freed him from the necessity of paying court to the public, whom he often insulted for their not comprehending him, and who, in return, endeavoured to make him sensible of their resentment, by the encouragement they gave to one of his own pupils, named Hylas. Pylades probably did not survive Augustus, who took umbrage at Hylas, and for some offence had him publicly whipped. Tiberius, unlike his predecessor, did not concern himself with the conduct of the pantomimes, and suffered the dissentions which perpetually occurred concerning them to take their own course. The consequence of such indifference, was, that the theatres became scenes of tumult and disorder, in which many persons of rank lost their lives. Then followed regulations and enactments, which only exasperated the evil, till there remained no remedy but the suspension or abolition of the exhibitions, and the banishment of the performers. Under the profligate Caligula, things took another turn. The theatres were reopened, and the amusements carried on in them becoming licentious accelerated the degeneracy of the times. Claudius permitted their continuance. In the reign of Nero, the disturbances and contentions to which they gave rise became again so alarming, and were so fatal, that it was found absolutely necessary for a time to prohibit the amusement. The emperor soon relented, and brought back the performers, who enjoyed the advantages of their art unmolested, until one of them, named Paris, excited the jealousy of the execrable Domitian, who put him and a young dancer to death, and expelled the rest from the city. On the assassination of Domitian they were recalled, and for a considerable time were tolerated in the exercise of their profession, which, however, was at length so much abused, and had become so grievously degraded, as to call forth the power of Trajan, who is reported by Pliny, though not very credibly, to have entirely suppressed them, with the universal concurrence of the people. It is clear, from the language of Juvenal, in his 6th Satire, that the *language* of these pantomimes was abundantly effective; and we can easily learn from his descriptions, to which the grossness of Dryden's taste has done ample justice, how completely some of the strongest passions of our nature may be communicated to an audience by means of actions and gestures alone, or, as one of his commentators says, "Per hoc docet, mores non modo turpia audiendo, sed etiam videndo facile corrumpi." Some of the amusements to be met with in the rudest states of society, as described by voyagers and travellers, confirm this remark, as will be admitted by most readers. But there is reason to believe that the pantomimic representations of the Romans extended much beyond the display and the corresponding excitement of the passions, and succeeded in depicting, or relating, a great variety of fables and stories, especially such as concerned the heathen mythology. Hence the performers required to be well educated, according to the opinions and taste of the day, and to be conversant with several arts and sciences. They sometimes obtained the honourable title of *χειροσοφοι*, which at once testifies the respect in which they were held, and indicates the chief means or instrument by which they elicited the admiration not only of the people at large but also of the gravest philosophers of their times.

The arts of design are of great antiquity, and might very naturally originate in the observation of some likenesses accidentally, or, more strictly speaking, physically produced. Thus the shadow of an object would suggest the notion of resemblance, and the transition from the knowledge of the fact to the attempt at copying and rendering permanent the image, seems sufficiently easy to have occurred in the earliest periods of society. Nor would it be difficult, after this, to advance to more independent specimens of imitation. We find few, if any nations, accordingly, which have not, from their remotest periods, possessed some acquaintance with the arts of design. When once established, or brought to such a completeness as to be any way descriptive, the products of these arts might seem a ready method of recording memorable events, or preserving the knowledge of important circumstances. It is to this additional or concomitant idea that we may ascribe those singular and often gigantic figures which have been met with in Egypt, and some of the eastern countries, cut out on immense pieces of stone, on rocks and mountains. Certain idolatrous purposes, there is reason to believe, contributed to their production; but even the principle engaged in this case implies the intention to commemorate remarkable deeds, or something eminent in the character and conduct of individuals. There are examples to be met with, of such statuary and other sculpture, among people far removed from those ancient kingdoms in which the arts of design were first brought to maturity,—as in the South-sea islands, especially Easter island, the colossal figures of which form a prominent, but very mysterious topic, in the narratives of Cook and Foster. (See also Humboldt's account of the figures on the granitic rocks of Guinea.) Delineations of objects on stones, the skins of animals, the bark of trees, and other substances, would probably be subsequent to such representations. But even these were familiar to people whom we should scarcely call civilized. Thus the natives of some of the North-American provinces are said to have been in the habit of using such methods in order to indicate particular districts and passes in their neighbourhood. The division of the land of Canaan, spoken of in the book of Joshua, was probably effected by means of a chorographic delineation, as may be inferred from chap. 18. verse 6.

It is in such designs that we are inclined to discover the origin of what has been called *hieroglyphics*, the numerous and varied specimens of which, as found in different countries, have excited so much curiosity, and occasioned so much labour among antiquarians. At what period this commenced or terminated with the Egyptians, whose productions in this department of literature are so remarkable, seems quite impossible to determine; but that the people of South America were in the habit of using it for some time after, as well as some time before, their conquest by the Spaniards, is beyond all question. The researches of Humboldt, on this interesting topic, are worthy of his established character, and deserve the attention of all who are anxious to trace either the progress of the nations of the New World, or the evidences of their connection with those of the Old. It is no objection to the value of his observations that the history of the American nations does not go farther back than the 7th century; for, besides that it is the identity or correspondence of origin as to the arts among distant people which it is so desireable to ascertain, independently quite of the differences of the epochs in which it may have been presented, it may be distinctly proved that the history of some of the northern nations of Europe does not reach farther back than the 10th century, a period at which, as has been noticed by the traveller above mentioned, Mexico was in a more advanced state of civilization than Denmark, Sweden, and Russia.

One of the purposes to which the Mexican hieroglyphics were directed was the preservation of genealogies. Humboldt describes one of these paintings, now deposited in the royal library at Berlin. It belonged to the Azteck people, is on a kind of paper which bears great resemblance to that of Egypt, and has retained the colours in a vivid state. The family whose genealogy it represents is that of the lords of Azcapozalco, a small territory in the valley of Mexico, to the north of the river Escapuzalco, who appear to have been descendants of the Acolhuan kings, governors of the country of Anapual, before the arrival in it of the Aztecks. The painting contains twenty-four generations, indicated by as many heads placed one above another, only one son being noticed, according to the uniform practice of the Indians, among whom every inheritance descends to the eldest son. It is conjectured that this drawing was made towards the end of the 16th century, and by order of a prince whose father and grandfather were still living. "This circumstance, (says Humboldt,) is clearly indicated by the small *tongues* placed at some distance from the mouth. A dead man, say the natives, is reduced to eternal silence: according to them, to live is to speak, and to speak much is a mark of power and nobility. These figures of tongues are also met with in the Mexican picture of the deluge, which Gemelli published from a manuscript at Siguenza, in which we see men born dumb, who disperse themselves to repeople the earth, and a bird that distributes among them thirty-three different tongues. In the same manner, a volcano, from the fact of the subterraneous noise heard sometimes in its neighbourhood, is figured by the Mexicans as a cone with several tongues hanging over its top; and a volcano is called *the mountain that speaks*." "The last branch of the lords of Azcapozalco is represented sitting on an Indian chair, with his feet at liberty: dead kings, on the contrary, are figured not only without tongues, but with their feet wrapped up in the royal cloak, which gives these images a great resemblance to Egyptian mummies." "In all the Mexican paintings the objects tied to a head by means of a thread, indicate, to those acquainted with the language of the nations, the names of the persons drawn by the artist. The natives pronounce these names when they see the hieroglyphic. Chimalpopoca signifies a buckler that smokes; Acamapitzen, a hand that holds reeds. Thus, to indicate the names of these two kings, predecessors of Montezuma, the Mexicans painted a buckler and a fist tied by a thread to two heads ornamented with a royal fillet,"

Another very frequent use of such paintings among the Mexicans was a kind of evidence in legal disputes. Humboldt describes one of them. It relates to the contested possession of an Indian farm; and the reason for having recourse to such delineations is very satifactorily explained by the circumstances of the society at the time in which they were employed. The profession of a lawyer, it seems, was still unknown, and the contending parties had to appear in person, and plead their own cause, either before the judge of the district, or the high courts of justice; but as sentence was not given immediately after they had been heard, they found it necessary or convenient to remind the judge of the matter in dispute, by leaving with him a hieroglyphical painting, in which its chief particulars were represented. Sometimes, and indeed periodically, the king himself presided in the assembly of the judges, and then the pictures were placed before him. "In criminal causes, (remarks the traveller,) the picture represented the person accused, not only at the moment when the crime was committed, but also in the different circumstances of his life preceding this action. The king, in pronouncing the sentence of death, made, with the point of a dart, a scratch across the head of the culprit represented in the picture." Such graphic memorials in law-suits are said to have remained in use in the Spanish tribunals long after the conquest,—in all probability because the natives and their victors did not understand one another's language; and it is well known that the Emperor Charles V. in endowing the university of Mexico, established a professorship for the explanation of hieroglyphical paintings. The office became latterly of no use, when, from the different organization of the courts of law, it was found more useful to employ professed lawyers to plead in them.

The state of hieroglyphical paintings among the nations of America deserves the more consideration from the circumstance of their being one of the few people, arrived at the same degree of civilization, who had not obtained that analysis of sounds which seems to have led others to the invention of alphabets. In all probability, the ease with which they accomplished their symbolical signs, and the extent to which these were carried as a medium of recording and communicating knowledge, prevented the introduction of letters among them. How far the resemblance, in this respect, between the natives of America and some of the Tartar or Mogul race may prove identity of origin, is a question which cannot be discussed in this place; but the fact itself is too curious, and indeed too important in its bearing, not to have merited insertion. Still the hieroglyphics of the Americans are decidedly unlike to those of the Egyptians, and are rather to be considered as delineations of facts than representative signs. The Aztecks, it is true, had real simple hieroglyphics for the elements, as water, earth, air,—also for the seasons, some portions of time, and sundry other particulars; and these signs, conjoined to the painting of events, conveyed a great deal of special information. They had even made some approach to that higher species of the art, which represents names by uniting signs that are associated with sounds. But they wanted a vast number of symbolical characters requisite to the painting not of things so much as of ideas; and it is likely that ages would have passed ere a people, probably as greatly attached to established manners and customs as the Chinese and other eastern nations, would have arrived at such a decomposition of words as might result in an alphabet. Imperfect as their hieroglyphics were, they nevertheless formed a good substitute for books and writings, and that they were therefore of material utility is fairly to be inferred, were there not direct proof of it in the circumstance of thousands of persons being employed in such paintings in the time of Montezuma. The Mexican manuscripts, as they have been styled somewhat inaccurately, and many of which are still preserved, are either deer-skins, pieces of cotton, or paper made from the leaves of the magney, (the *agave.*) The figures and characters which they contained were not traced on separate leaves; and the substance employed for them was not rolled up, like the manuscripts of the ancients, but folded in a zig-zag manner, somewhat resembling our fans. To the ends of these fasciculi were pasted tablets of light wood, one at top, the other at the bottom; so that, before being opened up, they had a close resemblance to our bound books, which vanished when they were looked into, as, in order to examine the contents, the whole folds required to be extended, first from the left to the right, and then from the right to the left. "In this respect, (says Humboldt,) the Mexican paintings are perfectly similar to the Siamese manuscripts preserved in the public library at Paris, which are also folded in zig-zag."

In general the figures of the body are dwarfish in the Mexican paintings, and, in respect of correct drawing, they are much inferior to the most imperfect productions of the Hindoos, Chinese, Japanese, and the people of Thibet. The heads are usually of an enormous size, and, from the length of the toes, the feet are like the claws of a bird. The outlines are commonly faulty throughout; but great attention seems to have been bestowed on the details and the colouring, which last is strong, and employed so as to produce striking contrasts. From these particulars, it will be easily understood that the Mexican paintings were intended for practical purposes, and not designed merely, if at all, for ornament; and it is not improbable, therefore, as Humboldt suggests, that correct painting would be as little studied by the artist as fine hand-writing by the literati of Europe.

The subjects treated of, in these paintings, as already noticed, were very various. Among them are enumerated annals of the empire, rituals respecting the days on which sacrifices were to be made, statements relative to cosmogony and astrology, law-suits, divisions of property, lists of tributes, genealogical tables, calendars of the civil and religious year, specifications of the penalties to be inflicted for crimes. For specimens of some of these topics, as illustrated in this manner, the curious reader is referred to Purchas's Pilgrims. A much more important collection than that of Mendoza, which is there copied, was made by the Milanese traveller Boturini. Unfortunately it has been either dispersed or so destroyed that only about an eighth part of it remains. There are other collections in the Escurial, Bologna, Veletri, Rome, Vienna, and Berlin; but the publication of a complete set of these singular works, so conspicuously interesting in the history of our species, is still a desideratum, which it would require the liberality of a government rather than the amplest means of any individual to supply.

The Mexicans and their neighbours were not the only inhabitants of the New Continent who made use of these delineations, as is noticed by the enlightened and indefatigable author to whom we are so much indebted for our acquaintance with this part of the world. Even in our own times, the natives of Cox's channel and Norfolk sound, in the 57th degree of north latitude, have employed them on wood, and probably without any communication from the south. Farther, the Iroquois and the Hurons made hieroglyphical paintings also on wood, which bear great resemblance to those of Mexico. The natives of Virginia, too, had paintings which represented, in symbolical characters, the events of sixty years; and notice is taken in the *Journal des Savans* for 1681, of a production found in the Indian village of Pommacomek, which represented the epocha of the arrival of the whites on the coast of Virginia, by the figure of a swan vomiting fire, thus indicating plainly enough the colour of the Europeans, their passage by water, and the agency of their fire-arms. In place of hieroglyphical paintings, the natives of various countries of America had recourse to more imperfect means, in order to record events, and some of these were common among those who latterly adopted picture-writing. Thus the nations of Anahual, as is noticed by Humboldt, made use of those knots and threads of various colours which the Peruvians call *quippus*, and " which are found not only among the Canadians, but in very remote times among the Chinese." An older writer, Mr John Lawson, surveyor-general of North Carolina, of which state he has given a very curious description, published at London in 1714, makes mention of a similar contrivance adopted with tolerable success by the people of that country. " The records of the country, says he, are a parcel of reeds, of different lengths, with several distinct marks, known to none but themselves, by which they seem to guess, very exactly, at accidents that happened many years ago; nay, two or three ages, or more. The reason I have to believe what they tell me on this account is, because I have been at the meetings of several Indian nations, and they agreed, in relating the same circumstances, as to time, very exactly."

Useful as such representations appear to have been found, they are not comparable to the hieroglyphics of the Egyptians, which may be considered a refined invention, the result of intellectual, and probably a very metaphysical abstraction, intended rather to signify, though, at the same time, conceal from all but the initiated, certain ideas and mysteries, rather than merely to represent external objects. They formed, in reality, a sort of a free-mason language, and were not used because no other mode of preserving knowledge was in being, but as something distinct from and additional to the common signs. Such at least is the opinion we are disposed to entertain respecting their origin and design; and hence we imagine, contrary to a very prevalent theory maintained by Bryant and other able men, that they did not precede but followed the discovery and the employment of alphabetical characters. Such, too, is the opinion of Dr Hales, whose valuable work on chronology may be profitably consulted for a brief view of this interesting subject.

Something similar may be said of the Chinese, who, in this respect, bear considerable resemblance to the Egyptians. Their ancient characters were, in all probability, the outlines of visible objects, and things merely intellectual could not be expressed by them. They therefore contrived to represent the operations of the mind metaphorically, that is, by figures drawn from the productions of nature. " Thus," says an old writer of their own, quoted by Sir William Jones, in the Asiatic Researches, Vol. II. p. 195, " the idea of *roughness* and of *rotundity*, of *motion* and *rest*, were conveyed to the eye by signs representing a *mountain*, the *sky*, a *river*, and the *earth*; the figures of the *sun* and *moon*, and the *stars*, differently combined, stood for *smoothness* and *splendour*, for any thing *artfully wrought* or *woven with delicate workmanship*. *Extension, growth, increase*, and many other qualities, were painted in characters taken from the *clouds*, from the *firmament*, and from the *vegetable* part of the creation; the different ways of moving, *agility* and *slowness*, were expressed by various *insects, birds, fish*, and *quadrupeds*." In this manner, then, it is conceived, the passions and sentiments of the mind might have been expressed by the pencil, and ideas not subject to any sense might have been represented or signified to that of sight; and thus we may perceive how hieroglyphics, which, taken in their largest sense, were originally imperfect outlines of the figures intended to be designated by them, would, in course of time, be transferred to intellectual objects, and become a sort of metaphorical language. Nay, following out this idea, it will not be difficult to understand how such figures as denoted the intellectual, moral, and other powers of certain beings, considered worthy of religious regard, should occasion the worship of the objects themselves which they represented. This is very well expressed in the Universal History, Vol. I. p. 508, edition of 1747, where a conjecture of Sir John Marsham's is stated as by no means improbable, that the use of these hieroglyphical figures of animals introduced some of the strange idolatry of the Egyptians; " for as those figures were made choice of according to the respective qualities and dignities of the persons they represented, which were generally their gods, princes, and great men, the people became gradually accustomed to these figures, which they used to place in their temples as the images of their deities, whence it is not absurd to imagine that they came at length to pay a superstitious veneration to the living animals themselves; and this opinion we rather approve than the opposite, of a late learned writer, (Shuckford,) who supposed the sacred animals were first appointed and consecrated to each god, and the hieroglyphics afterwards formed from them."

Distinguishing, then, between picture-writing and such symbols as the Egyptian hieroglyphics, we should say of the former, that it is absurd to attempt to discover in what country or among what people it originated, inasmuch as traces of its existence may probably be found indigenous wherever human beings may have had opportunities, from the establishment of the social state, to cultivate the faculty of imitation, and apply it to the useful purposes of life. With respect to the latter, the inquiry as to

Representative Language.

Representative Language.

its invention is quite a subject for the labours of the historian and antiquary, and may abundantly occupy them. It becomes, too, of the more consequence, if connected, as it ought to be, with the question recently alluded to, whether hieroglyphics, taken in this sense, preceded or followed the use of writing by alphabetical or arbitrary characters. But how difficult it is either to conduct this inquiry in a becoming manner, or to bring it to a satisfactory conclusion, may be readily perceived from the discordancies of those who have engaged in it. Some of these it may now be proper to exemplify.

The invention of hieroglyphics, according to Mr Bryant, was certainly a discovery of the Chaldeans; though, as he admits, "made use of in the first ages by the Egyptians,"—"the very nations," he adds, in support of his own theory, that, if the people of the first ages had possessed the secret of writing, they would never have descended to a less perfect mode of expressing their ideas, "the very nations who are supposed to have been possessed of the superior and more perfect art." Still, he thinks, they may have retained the former, after they had become possessed of the latter; and the reason he assigns for this supposition is, that their ancient records had been entrusted to hieroglyphics. But he is positive, that, if they had possessed letters originally, they would never have deviated into the use of symbols; "*at least*, (says he,) *for things which were to be published to the world*, and which were to be commemorated for ages." Now, besides that Mr Bryant seems, in these remarks, to have confounded picture-writing with hieroglyphics, it is obvious that, in alluding to what might have been intended to be published to the world, he excepts the precise motive and object for which hieroglyphics, in the confined sense, were employed, namely, concealment from all who were not initiated into the sacred rites and mysteries. It is another part of his theory, that there was no writing antecedent to the giving of the law at mount Sinai. "Here," says he, "the divine art was promulgated, of which other nations partook." But for this assertion he gives no proof, and, it may be safely said, no proof can be given. The sacred historian, in speaking of that splendid event, does not use a single expression which implies novelty as to the mode of recording "all the words of the Lord," or from which it can be inferred, that he himself was then instructed in an art then, for the first time, made known to mankind. Moreover, to take no notice of other matters recorded in the book of Genesis, for the preservation of which it is a probable supposition that writing was employed, we find mention made, in the fifth chapter, of "the book of genealogy," namely, from Adam to Noah; and this may be held to have been a written record, for, says Dr Hales, "how could it possibly record their names, and their generations, residues of life, and total ages, without written words? How could oral tradition hand down, through two and twenty centuries, unimpaired, thirty large and unconnected numbers, rising from a hundred to near a thousand years?" If it should be contended that this *book* of genealogy signifies merely a relation or narrative, by Moses himself, as to the ages of the persons spoken of in it, and is not to be understood as a separate treatise or volume to which he refers, still the difficulty mentioned by Dr Hales will remain to be overcome, and perhaps can be removed only by the supposition which he adopts, or the idea of the specific inspiration of the writer as to the subject recorded. Now, without denying this idea, it is allowable to say, on general principles, that it ought not to be *unnecessarily* maintained in this or any other case. Here also it may be added, as worthy of attention, though by no means demonstrable, that, in the opinion of Goguet, Job, who alludes to writing, was contemporary with Jacob, and knew of it, therefore, long before the time of Moses. "We may even suspect, (says he,) that Moses had learned the art of alphabetic writing in the country of Job, namely, Arabia, where he lived several years before his mission;" and he observes, very similarly to what has already been said, that, from the manner in which Moses speaks of the art of writing, "it sufficiently appears, that in his time it was not a discovery absolutely new. Moreover, some Jewish and Oriental traditions, alluded to by Dr Hales, carry the invention of writing so far back as to ascribe it to Seth, the son of Adam, as others do to Enoch the seventh from Adam; and, whether true or false, these two circumstances prove the prevalence of an opinion that the invention was antediluvian. Pliny, confounding together the Assyrians and the Babylonians, says of the former, "I think that letters were always found among them;" and Cicero, concurring in this opinion, assigns as a reason for it, that the Assyrians, being much engaged in astronomy, required the art of writing in order to record their observations. Gaspar Samedo, as is noticed by Dr Hales, asserts, from the Chinese annals, that hieroglyphics were not introduced into China till about 2060 B. C. or upwards of a thousand years after the deluge; and the Dr himself thinks it probable, that they were not earlier in Egypt than 2095 B. C. The opinion of this writer, as to their being subsequent to the use of alphabetical writing, has been stated, and in a qualified manner adopted.

But it is now fair to bring forward the sentiments of Goguet, whose extent and acuteness of enquiry entitle him to the highest respect in every question relative to the progress of our species. After enumerating those various nations who had adopted some sort of drawings and hieroglyphical representations for the communication of knowledge, and concluding that such universality could not be the effect of accident or imitation, but must be considered as "the voice of nature speaking in an uniform tone to the gross capacities of the first generations of man, he proceeds to point out what he judges an error among learned men, respecting the first use of hieroglyphical delineation, namely, their imagining it to have been employed by the Egyptian priests to conceal their knowledge from the vulgar. This mistake, according to him, has arisen from want of attention to change of circumstances, as he goes on to prove. The Egyptians, he says, "used hieroglyphics at first *only to transmit the knowledge of their laws, their customs, and their history to posterity.* It was nature and necessity, not art and choice, that produced the several kinds of hieroglyphic writing. They were an imperfect defective invention, suited to the ignorance of the first ages. The Egyptians used them because they knew not letters. If this people had first invented alphabetical writing, they would have been too sensible of its excellence to have used any other." These remarks, the reader will perceive to be very similar to what was formerly considered and answered. But besides being liable to the same objection, it is worth noticing the degree of perfection to which Goguet here admits this very *defective invention* to have been carried, and yet the reluctance which he supposes the people would have had to recur to it when they came to be possessed of the art of alphabetical writing; whilst he actually affirms, immediately after, that the most learned of the Egyptians, namely, the priests, did recur to hieroglyphical writing in order to conceal their knowledge, or, to use his own words, retained it as a convenient veil," when it had been "*abandoned by the bulk of the nation.*" Supposing the fact to have been as is here mentioned, it might be more properly said, that, in the hands of these priests, hieroglyphic writing was a convenient veil for their ignorance of the new and greatly superior art, or was continued by them from mere indolence and an aversion to improvement; but, certainly, the notion of their retaining hieroglyphics for the purpose of concealing their knowledge from those against whom, according to the theory itself, the disguise afforded no security, is either very like an absurdity, or can be redeemed from that character only by another and not very probable supposition, namely, that the priests, desisting from all attempts at protecting their mysteries from the profane gaze of their uninitiated contemporaries, contented themselves with hoping to accomplish this exemption at some distant period, when a mode of writing generally abandoned as imperfect, and superseded by a more useful system, should be forgotten by all but themselves.

The ancient Egyptians, according to Herodotus, had two sorts of letters, one of which was appropriated to sacred subjects, and the other employed on common occasions. This distinction gave rise to the terms *hieratic*, or sacerdotal, applied to the former, and *demotic*, or popular, applied to the latter. But other writers give different accounts of the matter, and supply other differences. Thus Clemens Alexandrinus says, that people used three sorts of letters, *epistolary*, or *epistolographic*, *sacerdotal*, or *symbolic*, and *hieroglyphic;* and in this opinion he is joined by Porphyry. Warburton, again, thinks with others, that they had four modes of writing, viz. the hieroglyphic, consisting of two kinds, the *cyriologic* and the *tropic;* the symbolic, consisting also of two kinds, one of which was simple and tropic, and the other mysterious or allegorical; the epistolographic, used in the ordinary concerns of life; and the *hierogrammatic*, dedicated to the purposes of religion. To these names, and several others, which have long been used in reference to the Egyptian characters, Dr Young, a zealous labourer in this department of literature, has recently added the term *enchoric*, or *enchorial*, from the Greek word signifying *country;* but this species, it may safely be said, might have been comprehended, without any particular title, under the general name demotic or popular. Having spoken of that gentleman, it is now requisite to take notice of some of his discoveries, or supposed discoveries, in this mysterious region, and his controversy with M. Champollion as to their respective merits in making them, though, we regret to say, we can scarcely be convinced that the result of the ingenuity and patience of either, or of both of these authors, is so valuable as to warrant any anxiety about a decision between them. Probably most justice may be done to both by following the track of the former in his latest publication.

He sets out with some remarks on the opinions respecting hieroglyphics prevalent in ancient and modern times, beginning with the Greeks and Romans. These people, according to him, paid little attention to any of those languages which they reckoned to be barbarous, and commonly satisfied themselves with some vague ideas on the subject, making up by positiveness of assertion for their deficiency of knowledge and indifference to the inquiry. It was their common belief that, as Egypt was the parent of all the arts and sciences, the hieroglyphical inscriptions which were found on the public monuments there contained the most important mysteries of nature, and the sublimest inventions of man; that the interpretation of them had been studiously concealed from the vulgar by the priests, who themselves, especially after the decline in national consequence, only imperfectly understood them; and that in the days of the later Roman emperors all correct knowledge of their real import was utterly lost. Among the moderns, Father Kircher and the Chevalier Palin appear to have thought that it was quite possible to recover and determine the source of the Egyptian hieroglyphics, solely by internal evidence and the force of their own reasoning; and the consequence was, the publication of an immense mass of fanciful representations and absurd conjectures, in which all difficulties were overcome, and all obscurities perfectly dispelled. Very different was the success of Zoëga, who, after collecting all that had been said and written on this fruitful topic, concluded, that the sum and substance of the whole was scarcely more than equal to nothing. One traditional record as to the true sense of a single character, namely, that supposed to denote Life, has been generally received; and a work by Horapollo affords, among much idle comment, and many erroneous assertions, a few hints, which, however imperfect, bear somewhat usefully on the probable sense of certain hieroglyphics. The expedition of the French to Egypt promised immense advantages both to science and to literature; and certainly all justice was done to it by the splendour of the work in which its history is recorded. The substantial fruit it produced was not equal to expectation; though Dr Young is seemingly a little prejudiced in saying, that "the only real benefit conferred on Egyptian literature by that expedition was the discovery of a huge broken block of black stone, in digging for the foundation of Fort St Julian, near Rosetta, which the British army had afterwards the honour of bringing to this country, as a proud trophy of their gallantry and success." On this black stone Dr Young may be said to have erected his system of interpretation which is to display such wonders; and he must therefore be indulged in thinking highly of its worth, and descanting somewhat lengthily on its capabilities. Brevity of description will comport with our own more moderate estimate. This celebrated stone, deposited in the British museum, bears on one side an inscription in two languages, the ancient Egyptian and the Greek, the former of which is in two distinct characters, namely, hieroglyhic and enchorial, so that the whole has been somewhat improperly styled trilingual, whereas the correct title would be triliteral. As the stone is not entire, but has suffered mutilation, the inscription is imperfect, that portion of it which is in the hieroglyphic character having been most injured. It consists of fourteen lines, that in the enchorial character of thirty-two lines, and that in the Greek of fifty-four; and the relation of these to each other is such that the first line of the hieroglyphic corresponds with the fifteenth of the enchorial character, and the twenty-seventh of the Greek,—the difference arising from the mode in which they are respectively written rather than from the different powers of the characters themselves. Thus one hieroglyphical line occupies as much in breadth as three lines in the Greek, the characters in the former being of various sizes, and placed one above another, two or three in breadth. This is sometimes the case also with the enchorial lines, the letters of which, however, more generally follow each other, as in the Greek, all the words of which are written in the usual manner. Soon after the arrival of this stone, the society of Antiquarians procured an engraving of the inscription which gave it interest, and copies of this were liberally distributed among the literati from whom any successful efforts at exposition could be expected. Several tried their ingenuity on the mystery, as Porson and Heyne on the Greek, which certainly offered the easiest task, and Silvestre de Sacy and Mr Akerblad on the enchorial department. Mr Porson was not quite so fortunate in his labours as Heyne; and of the two latter gentlemen, De Sacy, after making out the names of Ptolemy and Alexander, abandoned the investigation, and the latter added several names, as Arsinoe, Berenice, Philinus, and Pyrrha, and formed an alphabet of thirty-one letters and three numerals, arranging them according to the order of the Coptic, and pursuing throughout the course adopted by Barthelemy with respect to the Palmyrenian alphabet, namely, first finding out the proper names, and then ascertaining the letters which they had in common. This gentleman found great difficulty in identifying the Egyptian words of the inscription with the Coptic, such as he knew it in the version of the Bible and other works; and it hence appeared, that, in the course of about five hundred years, the distance of time between the date of the inscription and that of the oldest Coptic book, the language had undergone a much greater change than had occurred in the languages of Greece and Italy during a period of two thousand years. The inference to be drawn from this circumstance is very forcibly stated in an article in the Ecclectic Review for December 1823. "This will at once show the great difficulties with which its expounders have to contend, and the uncertain basis on which many of their interpretations must rest. First, they do not understand the character; next, if this difficulty were surmounted, they do not undertand the language it is employed to express; and, granting that an unknown language might be deciphered, yet, where there exist no means of correction, as in the present case, the most expert and accomplished decipherer must be liable to frequent mistake, or rather the utmost that he can attain will be an approximation to the meaning, a probable guess. We may further remark, that although the idiographic hieroglyphics, or direct representations of the objects would be the same in all languages, yet, when they came to be used *phonetically*, they would differ as widely as the languages themselves. The word *man*, for instance, means, in English, the same that the word *homme* does in French; and its idiographic hieroglyphic would be the same in both languages; but the phonetic hieroglyphics in each would necessarily be different. Thus, the M in man might be represented by a mouse, a marmot, a monkey, or any idiographic hieroglyphic the initial sound of which answered to the M. In the same manner, H in the French word *homme*, would be represented in phonetic hieroglyphics by an owl, (*hibou,*) a swallow, (*hirondelle,*) or any other idiographic sign whose initial letter was H; and so on throughout the letters respectively composing the words *man* and *homme.* Hence, when these idiographic hieroglyphics come to be written hieretically, and enchorially or demotically, they would necessarily have a quite different power in different languages; and thus the alphabets of the several countries would vary, not arbitrarily or accidentally, but owing to the letters being formed from phonetic hieroglyphics altogether dissimilar." It is stated in the Classical Journal, No. 19, published in 1814, that the fac-simile of the inscription distributed by the society of Antiquarians had, after seven years, produced only one Latin translation by Professor Heyne, and another in English by the Reverend Stephen Weston, together with learned annotations by both of them, and also additional ones by Mr Taylor Combe; but a translation of it by Mr Gough, corrected by Mr Porson, was published in 1809.

Hitherto the hieroglyphic portion of the inscription remained a *terra incognita.* Dr Young was the first who attempted to explore it, having previously acquainted himself with the remains of the old Egyptian languages, as preserved in the Coptic and Thebaic versions of the Scriptures, in the hope of finding an alphabet which might enable him to read the enchorial inscription. In this, however, he was disappointed; and he felt himself compelled to the conviction, that no such alphabet would ever be discovered, for the best of all reasons, namely, "it had never been in existence." But while occupied in the investigation of this subject, he discovered numerous characters which were obviously imperfect imitations of the hieroglyphic pictures in the first inscription; and he was, in consequence, induced to expect that he should be more able to interpret the

Representative Language.

old Egyptian manuscripts by means of the hieroglyphics than those by the former. The results of a cursory examination of about 90 or 100 characters in the hieroglyphical inscription, in its mutilated state, were, *first,* That many simple objects were represented by their actual delineations; *secondly,* That many other objects represented graphically were used in a figurative sense only, while many symbols, frequently used, could not be considered as pictures of any existing objects; *thirdly,* That, to express a plurality of objects, a dual was represented by a repetition of the original character; and that an indefinite plurality was denoted by more characters of the same kind, or more compendiously by three lines or bars attached to a single character; *fourthly,* That definite numbers were expressed by dashes for units, and arches, either round or square, for tens; *fifthly,* That all hieroglyphical inscriptions were read from front to rear, as the objects naturally follow each other; *sixthly,* That proper names were encircled by the oval ring or border, or *cartouche,* of the sacred characters, and often between two fragments of a similar border in the running hand; and, *lastly,* That the name of Ptolemy alone existed on this pillar, having been completely identified by the assistance of the analysis of the enchorial inscription. He claims the merit of having exclusively made these discoveries, not one of which had ever, so far as he had heard or read, been established and placed on record by any other person, *dead or alive.* He also asserts his pretensions to another discovery, for which M. Champollion has not given him credit; for "the interpretation of the female termination, (namely, an oval and a semicircle,)" says he, "had never, I believe, been suspected by any but myself; nor had the name of a single god or goddess, out of more than five hundred that I have collected, been clearly pointed out by any person." And, moreover, he thinks himself aggrieved by M. Champollion's stating, that he had recognized the phonetic values of four of the characters, when "he had actually specified *nine*" in the article Egypt given in the Supplement to the Encyclopædia Britannica. There is obviously a good deal of feeble vanity, and, perhaps, not a litle impolitic censoriousness in these and several other remarks of Dr Young; but without attempting or wishing either to extenuate or to exaggerate them, it is fair to mention, that he makes some liberal admissions with respect to M. Champollion, and gives a tolerably judicious estimate of the nature and value of that gentleman's enquiries, as compared with his own. The following abstract regarding these will put the reader in possession of some rather curious information.

Dr Young's conviction of the nature and origin of the enchorial character was declared in a collection of letters inserted in the *Museum Criticum,* and published in 1815. In the next year he obtained what he held to be complete evidence of the truth of his opinion, having discovered that several of the manuscripts on papyrus, which had been carefully copied in that magnificent work the *Description de l'Egypte,* "exhibited very frequently the same text in different forms, deviating more or less from the perfect resemblance of the objects intended to be delineated, till they become, in many cases, mere lines and curves and dashes and flourishes, but still answering, character for character, to the hieroglyphical or hieratic writing of the same chapters found in other manuscripts, and of which the identity was sufficiently indicated, besides this coincidence, by the similarity of the larger tablets or pictural representations at the head of each chapter or column, which are almost universally found on the margins of manuscripts of a mythological nature." The enchorial inscription of the stone brought from Rosetta bore an accurate resemblance, in general aspect, to the most unpicturesque of these manuscripts; but it did not by any means agree, character for character, with the "sacred letters" of the first inscription. Still, in many instances, it was practicable, by means of some intermediate steps furnished in the manuscripts on papyrus, to trace these characters into each other, in such a manner as superseded the idea of there being any essential diversity in the principles employed in their representation. The want of entire coincidence was explicable on the supposition of the sacred characters being the remains of a more ancient and solemn mode of expression, superseded by other more common methods; and, "in several cases, it seemed probable, that the forms of the characters had been so far degraded and confused, that the addition of a greater number of distinguishing epithets had become necessary, in order that the sense might be rendered intelligible." Dr Young imparted this comparison of the different modes of writing, together with a detailed reference to the passages in the respective manuscripts whence they were derived, to the 7th number of the *Museum Criticum,* which was printed in 1816, but not actually published till 1821; the part of the Supplement to the Encyclopædia Britannica in which the principal points thus communicated were also made known, having appeared a year or two earlier, some separate copies being, moreover, circulated among the doctor's friends in the summer of 1818. These copies had each a cover entitled Hieroglyphical Vocabulary, and the characters therein explained "with confidence," amounting to about 200, "the number which had been immediately obtained from the pillar of Rosetta having been somewhat more than doubled by means of a careful examination of other monuments, on which the terms god and king, and other epithets already ascertained, were so applied as to furnish either certain or probable conclusions respecting the principal deities of the Egyptians, and respecting several of the later and the most celebrated of their sovereigns." The higher numerals were determined by comparing some inscriptions in which they were combined with units and tens; and in this process he was aided by the hieratic manuscripts, which afforded the hieroglyphics corresponding with given enchorial characters. The names of Phthah and Apis were still left on the pillar; and to these Dr Young was enabled to add those of Ammon or Jupiter, Phre or the sun, Rhea or Urania, Ioh or the moon, Thoth or Hermes, Osiris, Arueris or Apollo, Isis, Nephthe, Buto, Horus, and Mneuis, besides many others, to which he found it convenient to appropriate fabulous or temporary appellations, for the sake of references. He farther ascertained, by the help of Greek and Latin historians and inscriptions, the names of several kings, as Mesphres, Memnon, Sesostris, Nechao, Psammis, and Amasis; and having obtained the designation of Ptolemy Soter from the pillar, he was able, by means of it, to determine the name of his queen, viz. Berenice,—the termination indicating the female sex being, as already mentioned, an important result of the comparison of various monuments. He acknowledges, that his respect for his "Egyptian allies" did not keep pace with his increase of acquaintance with their mythology, as thus gradually displayed before him. "That Plato," says he, sensibly enough, "professed to have learned much during a long residence in Egypt, I can easily believe; he may, very probably, have derived from thence some hints that led to his own purer doctrine of the immortality of the soul, although he may have been tempted to exaggerate a little the other advantages of his travels in search of truth; but that Pythagoras ever professed to have acquired any solid knowledge from the Egyptians, appears to me to be very inconsistent with what we know of this illustrious philosopher, speculative and visionary as some of his arithmetical metaphysics seem to have been." It is clear, indeed, that the estimate yielded by the inscriptions on the principal Egyptian monuments cannot be high. Almost all of them are either sepulchral or votive. "Astronomical and chronological there seem to be none, since the numerical characters, which have been perfectly ascertained, have not yet been found to occur in such a form as they necessarily must have assumed in the records of this description; of a historical nature we can only find the triumphal, which are often sufficiently distinguishable, but they may also always be referred to the votive, since whoever related his own exploits thought it wisest to attribute the glory of them to some deity; and whoever recorded those of another was generally disposed to intermix divine honours with his panegyric." "It has, indeed, been asserted," continues Dr Young, "that the Egyptians were not in the habit of deifying any mortal persons; but the inscription of Rosetta is by no means the only one in which the sovereigns of Egypt are inserted in the number of its deities; the custom is observable in monuments of a much earlier age. Indeed, in such a country it might be considered as a kind of dilemma of degradation whether it was most ridiculous to be made a divinity, or to be excluded from so plebeian an assemblage; but flattery is more prone to err by commission than by omission, and, consequently, we find the terms king and god very generally inseparable."

But it is in sepulchral inscriptions that Egyptian literature is most abundant; and these present us with some peculiarities worthy of notice. Their general tenor seems to be the identification of the deceased with the god Osiris, or, if a female, with Isis; and the most frequent representation is the reception of the individual by the principal deities, to whom he is conceived to bear the relation which is expressed in the inscription allotted to him; "The honour of an apotheosis, reserved by the ancient Romans for emperors, and by the modern for saints, having been apparently extended by the old Egyptians to private individuals of all descriptions, as indeed appears to be partially hinted in the concluding line of the golden verses of the Pythagoreans." An extensive comparison of these inscriptions was necessary, in order to discover their precise nature; for the names were rarely enclosed in a ring of the usual form. Sometimes the name of the person is repeated, and is preceded by that of Osiris, as in the case of the green sarcophagus in the British museum; but, more frequently, instead of the name, certain characters bearing a relation to the individual are combined together after the symbols of Osiris, and not unfrequently this combination is repeated. That it bears some relation to the individual deceased is rendered highly probable by the diversity of such combinations in different monumental inscriptions, scarcely any two of which agree in this particular, though quite alike, or very similar, in all other respects;" "and this same phrase (says Dr Young) may be observed in Lord Mountnorris' and Mr Banks' manuscripts, placed over the head of the person who is brought up between the two goddesses, to make his appearance before the true Osiris, in his own person, and in his judicial capacity, with his counsellors about him, and the balance of justice before him." The reader will gain a tolerably correct idea of such a representation, by perusing the following description:

"The tablet of the last judgment, which is so well illustrated by the testimony of Diodorus concerning the funerals of the Egyptians, is found near the end of almost all the manuscripts upon papyrus that are so frequently discovered in the coffins of the mummies, and, among others, in Lord Mountmorris' hieratic manuscript printed in the collection of the Egyptian society. The great deity sits on the left, holding the book, and the whip or fan; his name and titles are generally placed over him, but this part of the present manuscript is a little injured. Before him is a kind of mace, supporting something like the skin of a leopard; then a female Cerberus, and, on a shelf over her head, the tetrad of termini, which have been already distinguished by the names Tetrarcha, Anubis, Macedo, and Hieracion, each having had his appropriate denomination written over his head. Behind the Cerberus stands Thoth, with his style and tablet, having just begun to write. Over his head, in two columns, we find his name and titles, including his designation as a scribe. The balance follows, with a little baboon as a kind of genius sitting on it. Under the beam stand Cteristes and Hyperion, supposed by M. Champollion to be Anubis and Horus, who are employed in adjusting the equipoise; but their names in this manuscript are omitted. The five columns over the balance are only remarkable as containing, in this instance, the characteristic phrase, or the name of the deceased, intermixed with other characters. Beyond the balance stands a female holding the sceptre of Isis, who seems to be called Rhea, the wife of the Sun. She is looking back at the personage, who holds up his hand as a mark of respect, and who is identified as the deceased by the name simply placed over him, without any exordium. He is followed by a second goddess, who is also holding up he hands in token of respect, and whose name looks like a personification of honour or glory, unless it is simply intended to signify " a divine prophetess," belonging to the order of the Pterophori mentioned on the Rosetta stone. The forty-two assessors, noticed by Diodorus, and by these manuscripts, are wanting in this tablet, and in many other manuscripts their number is curtailed, to make room for other subjects; but, in several of those which are engraved in the *Description de l'Egypte*, they are all represented, sometimes as sitting figures, and sometimes standing as termini, with their feet united."

The text in these manuscripts generally consists of hymns to certain deities, expressed in the name of the deceased, to which is added his title of Osiris, the true Osiris himself appearing in the groups which are introduced. A series of pictural tablets occupies the upper part of each manuscript, and under these are vertical columns containing distinct hieroglyphics, or, as in the case of the epistolographic manuscripts, there are pages of text divided into paragraphs, with a tablet at the head of each, and the first words of which are constantly written with red ink, made of ochre, the black ink which is elsewhere used being of a carbonaceous substance. These manuscripts are seldom entire at the beginning, which is always at the outside of the roll. Similar representations are met with on the coffins of the mummies, and the larger stone sarcophagi. Thus we find the judicial tablet on the centre of the former, with Isis and Nepthe above, at the sides, and, as is imagined, Rhea, with outspread wings, on the middle, the space below being occupied by several figures of the principal deities to whom the deceased is conceived to be doing homage, and each of whom is probably designated by the relationship in which he stands to the individual now assumed as a representative of Osiris; but in the sculpture the figures are not usually so numerous, though the same deities are represented, only without the repetition of the suppliant, and in an order somewhat different.

The most magnificent of the triumphal monuments are the obelisks, which Pliny reports to have been dedicated to the sun; and it is highly probable that the translation of the inscription on one of them, as preserved by Ammianus Marcellinus, affords a true representation of part of its contents. The symbols found on these, such as the hawk, the bull, and the arm, usually occupy the beginning of each inscription, and are commonly followed by pompous titles, not very distinctly connected with each other, and among these, very frequently, that of " Lord of the Asp bearing diadems," with others which immediately precede the name and parentage of the sovereign who forms the subject of the inscription. Of the obelisks known to exist, about thirty, of different dimensions, may be reckoned genuine, the others having been sculptured in imitation of the Egyptian style, and that often so unskilfully as to present a very obvious contrast to those that are of more ancient date, and served as the models. " Such (we are informed by Dr Young) are the Pamphilian, in explanation of which the laborious Kircher has published a folio volume, and the Barbarinian or Veranian: in both of these the emblems are put together in a manner wholly arbitrary; and where an attempt is made to imitate the appearance of a man, the characters are completely different at each repetition. The Sallustian obelisk has also been broken and joined inaccurately, and some modern restitutions have been very awkwardly introduced, as becomes evident upon comparing with each other the figures of Kircher and of Zoëga. A similar imitation has been rather better executed at one corner of the Lateran obelisk. The block of granite which has been employed still exhibits some words of a Latin inscription turned upside down, but not effaced, although the hieroglyphics belonging to the place have been embossed with tolerable fidelity. Another very celebrated monument, the Isiac table, which has been the subject of much profound discussion, and has given birth to many refined mythological speculations, is equally incapable of supporting a minute examination upon solid grounds; for the inscriptions neither bear any relation to the figures over which they are placed, nor form any connected sense of their own; and the whole is indisputably the work of a Roman sculptor imitating only the general style and the separate delineations of the Egyptian tables."

Mr Salt having observed an inscription of the Ptolemies over the principal entrance at Dakki, in Nubia, and a tablet of hieroglyphics on each side of it, nearly similar one to the other, was struck with the idea that the latter might contain a translation of the former; and accordingly, referring to a letter in Mr Banks's possession, which contained about fifty explanations of hieroglyphics by Dr Young, he had the satisfaction to find, that in the oval ring, conspicuous on each side, was the name of " the immortal Ptolemy;" and immediately afterwards the name of Hermes on one side, and of Isis on the other, to whom it was ascertained, by Greek inscriptions, the temple had been dedicated. He found the name of Ptolemy in other parts of the temple, and also those hieroglyphics, supposed by Dr Young to designate Osiris, Isis and Horus, as well as Hermes, over their respective figures, throughout the numerous representations on the walls. Dr Young obtained access to Mr Banks's collection of drawings and incriptions, on his return to England, and from these he derived additional knowledge. Thus, he inferred, that the symbol for *brother* or *sister* is the *crook* which is generally seen in the hands of Osiris, and which he observed to be imitated in the enchorial character already ascertained by him; that the emblem which he had taken for *mother* could only be translated *wife*, as it was applied to Cleopatra in relation to her husband Ptolemy; and that a *father* was denoted by a bird with an arm, as he had formerly imagined from an examination of the pillar of Rosetta. When at Leghorn, in 1821, Dr Young discovered, among a multitude of Egyptian antiquities, belonging to M. Drovetti, French consul at Alexandria, a stone, containing an enchorial and a Greek inscription, which was known to have once existed at Menouf, but was for long supposed lost. This appeared to him, at the time, to be of the highest importance, as the only supplement to the pillar of Rosetta yet discovered; and he naturally became exceedingly desirous to possess impressions of its contents; for which purpose he made liberal proposals to M. Drovetti, who, however, from cupidity, it is stated, chose not to gratify him: "But," says the Doctor, "as it often happens to those who are too eager to monopolize, he has now withstood his market, and the pearl of great price, which, six months ago, I would have purchased for much more than its value, is become scarcely worth my acceptance."—He was anxious to obtain from it a confirmation of his interpretation of the enchorial inscription on the Rosetta pillar; but the acquisition of other materials soon repressed his eagerness to obtain a copy, by supplying the illustrations and aid of which he was in quest. The chief of these was a parcel of manuscripts brought by M. Casati to Paris, among which M. Champollion discovered one, the preamble of which considerably resembled the enchorial text of the Rosetta incription; and the value of this discovery is enthusiastically declared to have been afterwards "almost miraculously multiplied by the existence of a Greek translation of the same manuscript," brought to London by Mr Grey. In the same spirit, alluding to the kindness of that gentleman, and paying due attention to the composition of a climax, he says, "I could not but conclude, that a most extraordinary chance had brought into my possession a document, which was not very likely, in the first place, ever to have existed, still less to have been preserved uninjured, for my information, through a period of near two thousand years; but that this very extraordinary translation should have been brought safely to Europe, to England, and to me, at the very moment when it was most of all desirable to me to possess it, as the illustration of an original which I was then studying, but without any other reasonable hope of being able to comprehend it. This combination would, in other times, have been considered as affording ample evidence of my having become an Egyptian sorcerer." Of a document so singularly important, and so singularly destined, it would be unpardonable not to give an ample elucidation; and to this we proceed, passing over the prefatory matter, in which Dr Young has thought proper, in measured terms, and with qualifications, both to commend and to reprehend M. Champollion. Dr Young's own words will best express the reasons for the admiration and gratitude which such a treasure ought to excite: "The contents of Mr Grey's Greek manuscript are of a nature scarcely less remarkable than its preservation and discovery: It relates to the sale, not of a house or a field, but of a portion of the collections and offerings made from time to time, on account, or for the benefit of a certain number of Mummies, of persons described at length, in very bad Greek, with their children and all their households. The price is not very clearly expressed; but, as the portion sold is only a moiety of a third part of the whole, and as the testimony of sixteen witnesses was thought necessary on the occasion, it is probable that the revenue thus obtained by the priests was by no means inconsiderable." If the reader should deem this a trivial matter, and not likely to realize any remarkable benefits, he has yet to take the very first step in Egyptian learning. It is in such elements, without the aid of direct information, that we are to obtain the light by which we shall be conducted through its mysteries, if these are ever to be explored. Whether the labour of the journey shall be recompensed by the attainment of any object on which it may terminate, is quite another question. Not to hazard an answer to it, we may safely admit the correctness of Dr Young's estimate of the relative worth of such a document. "The result, derived at once from this comparison, is the identification of more than thirty proper names as they were written in the running-hand of the country. It might appear, upon a superficial consideration, that a mere catalogue of proper names would be of little comparative value in assisting us to recover the lost elements of a language. But, in fact, they possess a considerable advantage, in the early stages of such an investigation, from the greater facility and certainty with which they are identified, and from their independence of any grammatical inflexions, at least in the present case; by means of which they lead us immediately to a full understanding of the orthographical system of the language, where any such system can be traced."

The pillar of Rosetta exhibited only foreign names, and could therefore afford little or no information as to the mode of writing the original Egyptian names of the inhabitants, in which respect Mr Grey's manuscript was of service, as the general inference to be derived from the examination of the names contained in it is more in favour of an extensive employment of an alphabetical mode of writing. An alphabet, formed by Mr Akerblad out of the foreign names of the enchorial inscriptions, aids materially in the discovery of the words which occur in these documents; but many more words appear to be rather syllabically than alphabetically constituted, and the names of the deities are commonly employed in writing them. Dr Young admits, however, that the employment of that alphabet is not entirely confined to foreign, or at least to Grecian names, and that it is applicable to such words as Lubais, Tbacais, Phabis; while he seems to regret that its ingenious fabricator should have rested on the authority of certain Greek authors, who pretended that the Egyptians employed on many occasions, an alphabetical system consisting of only twenty-five letters, to the discovery of which he probably limited his labours, and that these labours, imperfect as the principle was on which they were founded, were directed almost solely to one part of the inscription on the Rosetta stone, namely, the middle division, as formerly stated. "The antigraph," now described, is not the only acquisition for the use of which Dr Young felt indebted to Mr Grey. That gentleman possesses a second papyrus, of much larger magnitude, which contained three Egyptian conveyances in the enchorial character, with separate registries on the margin, in very legible Greek. These not only served to illustrate similar documents, but also afforded many additional examples of enchorial proper names, besides an idea of the general subjects of the respective manuscripts, namely, the sale of lands in the neighbourhood of Thebes. Speaking of the utility of these, he remarks, with to discourage him with respect to the application of his alphabet, though he was satisfied, that if the steps of the formation of an alphabet were not exactly as he had pointed out, they must at least have been very nearly of the same nature; and he endeavours to shew, from a correspondence with him, that M. Champollion is not altogether so averse to the admission of syllabic characters on some occasions as his language elsewhere would seem to imply. On one proposition, which, if true, would lead to curious, perhaps highly important consequences, he is at issue with that gentleman, and pronounces a judgment, in which, with all respect for the perseverance and the skill of M. Champollion, we are disposed, in the present state of matters, entirely to coincide. M. Champollion, it appears, is for referring the name, which Dr Young considered as that of the father of Amasis, to SESOSTRIS, as synonymous with RAMESES, which he supposes the characters express phonetically. Now, Dr Young readily allows, that this name, where it is written fully and accurately, as it often is in Mr Banks's great catalogue of Abydos, may, without much violence, be read nearly as M. Champollion proposes, “ the approved by Phthah, Ramesses,” or, “ the counterpart of Phthah, Ramesses,’ the first part of the group undergoing several synonymous variations, while the end remains unchanged; although, even on this mode, he would refer the first name to Amenophis or MEMNON, the son of Rameses, or of Armeses, called Miamun, to whom the tomb of (Dr Young's) Amasis is said to be attributed in the Greek and Latin inscriptions found on it; who is also said to have built the palace of Abydos, on which this Amasis evidently appears as founder; who is more easily understood than Amasis to be prior to the Psammetechus mentioned at Ebsambul; and who is more likely than Amasis to have been at Berytus, or Nar el Kelb, where Mr Wyse, as Dr Young was informed by Sir William Gell, has distinctly observed this name, accompanied by the nail-headed characters. These reasons Dr Y. thinks more than sufficient to counterbalance the assertion of Pliny; and it would be necessary to change Psammis, according to his place in Mr Banks' Table of Kings, into the Armais of Manetho, though the *vocal* Memnon of the numerous inscriptions would thus be converted into Rathotis, or, to leave out three of Manetho's lists, to bring him up to Amenophis, the Trojan Memnon of that author. “ All this is, indeed, a little alluring, says Dr Y. and, several suppositions might be introduced to overcome the difficulties; but unfortunately the fundamental supposition appears to be liable to an insurmountable objection, that the circle, which Mr C. considers as equivalent to the RE or RA of Rameses, is also the first character of each of the seventeen names immediately preceding it, and indeed of every other in the catalogue that remains unmutilated at the beginning.” He concludes in these words: “ I am therefore sorry to say that I cannot hitherto congratulate Mr C. on the success of his attempt to carry his system of phonetic characters into the very remotest antiquity of Egypt: he appears, however, to have a better prospect of elucidating some of the Persian names, having, as he informs me, been able to identify that of Xerxes, both in the hieroglyphics and in the nail-headed characters, by means of a rose of alabaster, on which both are found together. This is, indeed, a wonderful opening for literary enterprise; and I am even inclined to hope, from Mr C.'s latest communications, that he will find some means of overcoming the difficulties that I have stated respecting the Pharaohs; for he assures me that he has identified the names of no less than thirty of them, and that they accord with the traditions of Manetho, and, as far as he can judge, with the notes that I had sent him of an attempt that I had formerly made to assign temporary names to the kings enumerated at Abydos, in which those of all the later ones began with the syllable RE. He will easily believe that I wish for a satisfactory answer to my own objection; and, in fact, the farther he advances by the exertion of his own talents and ingenuity, the more easily he will be able to admit, without any exorbitant sacrifice of his fame, the claim that I have advanced to a priority with respect to the first elements of all his researches; and I cannot help thinking that he will ultimately feel it most for his own substantial honour and reputation to be more anxious to admit the just claims of others than they can be to admit them.”

So much for the rival pretensions of these two highly meritorious individuals. We have still to give a few sentences of a very general nature and extensive application. The language of heraldry seems to furnish an example of hieroglyphics, to which, it is somewhat remarkable, these two gentlemen have not referred. Its chief component parts, namely, the figures of natural, artificial, and imaginary objects, are used to denote events, qualities, characters, and names, to which they are often only incidentally related; and they may be justly considered as constituting a species of hieroglyphics, which, in all probability, would successfully compete with that of the Egyptians in comprehensiveness and accuracy, as it certainly appears to do in unintelligibility to all who have not studied its elementary principles and conventional relations. In reality, it is quite an easy, as it is a natural process, to represent things by images, and it is reasonable to suppose that the proper names commonly used in such a country as Egypt, and among such a people as its natives, would be picturally expressed. The introduction of foreign names, especially those which were not known to possess any special meaning, would occasion some change, even supposing no other event brought it about. These would only be recognized as sounds, and would require some new process in order to be expressed. To a certain extent portraits of the individuals would in all probability be had recourse to in some cases. But these could not always be had, and at all events would be very troublesome, and liable to misapplication. A remedy for the inconvenience might be suggested in the employment of what M. Champollion terms phonetic characters, that is, symbols to designate not ideas or things but sounds; and these perhaps varied according to circumstances, as applicable at the beginning, in the middle, or at the termination of compound words. Hence the identity of meanings, or at least the connection in significations among different characters, or, in other words, the variations in the forms of synonymous letters. The language of China affords something like an example of this sort, and, when well understood, may be found to present much fewer letters than is commonly imagined; indeed perhaps not more than constitute M. Champollion's alphabet. We have now two modes of writing, which it is evident might be read either separately or in combination. Each of them presents its own peculiar difficulties to a person unacquainted with the things alluded to, and the sounds vulgarly used to denote them; but in the case of their union in the same writing, especially if the alphabetical character employed were any way corrupted from the original pictural representation, as we know it often was, the embarrassment to a reader must be more than the simple results of their aggregate operation, the place and the reason of change forming additional peculiarities in the problem. These additions are obviously of the same nature with those which arise from the diversities of alphabetical characters, only more considerable, as being in the proportion of words to letters. There is some ground to apprehend, however, that this source of difficulty may, in the hands of *very ingenious persons,* become superabundantly fruitful of discoveries, unless the causes of the distinctions in the forms be ascertained and systematically arranged. But waving all such ideas, it seems probable, that the phonetic writing of the Egyptians bears a close affinity with the Chinese and other eastern modes; if not, that it suggested alphabetic writing to the nations of the western world. It is here taken for granted, be it noticed, that the common opinion respecting the Chinese language, the opinion, moreover, of Sir George Staunton, a very competent judge, is correct, namely, that its characters are emblematical, at least in part, and that to a high degree; though Mr Barrow thinks they are altogether arbitrary, and made up of combinations of the right line, the curved line, and the point. This last system we have no doubt was adopted, when it was found necessary to depart from the original representations, in order to compile a dictionary; and certain it is, that a very few lines, whether straight or curved, may, either with or without the help of points, be sufficient to answer all the purposes of the most copious and expressive language. But the difficulty would always be experienced of getting any race of mankind at once to adopt such a conventional system, and in no circumstances would this be greater than in a very early stage of society. It is yet to be proved, that the Chinese language, to the perfection and philosophical accuracy of which there seems a spreading disposition in modern times to do homage, was the scientific invention of a body of literati, and not the result of aukward imitations and gradual efforts at increased convenience, as there is reason to believe was the case with most other original written languages. Here, however, another opinion delivered in the Quarterly Review, (No. 55.) on Champollion's researches, may deserve to be quoted, as conveying additional information on this part of our essay. We shall give it in a condensed form. M. Champollion supposes that the Egyptians, like the Chinese, who had no fixed alphabet, when they wrote foreign names, used *signs,* the names of which seemed to them nearest the sounds of the syllables or letters required; whence it would happen, that as they had no settled system of sounds, various persons would represent these sounds variously, according to the guidance of their own ears. And thus it is, that we find the same Greek letter represented by different Egyptian hieroglyphics, which is also quite the case with the Chinese, not two of whom, such is the multitude of their characters, and such the paucity of the monosyllabic sounds by which they are represented, might happen to write a foreign name in the same way, though all would be able to pronounce it. But these people did not follow the method adopted by the Egyptians, as M. Champollion imagines; for their language being syllabic, and each of their characters a monosyllable, they had no idea of spelling a word by letters. Consequently, among the Chinese, any foreign word, written in this language, contains as many characters as it has syllables. Thus *Ptolemy* would be expressed in their way, *Pto-le-my,* in three characters, having the small sign of the word *mouth* at the upper corner to signify that they were merely phonetic, and not significant of their usual meaning. Now, conceiving there is no connection between the sense of a hieroglyphic, when used phonetically, and as an idiographical character, M. Champollion's alphabet gives no aid as to the knowledge of the Egyptian symbols which stand for ideas, though it may enable any one to read the Greek and Roman names on the ancient monuments of Egypt, and thus may prove useful to the archæologists. The reviewer, moreover, conceives him to be wrong in thinking that the ancient Egyptians made use of an alphabet to represent the sounds and articulations of certain words *before* the domination of the Greeks and Romans; one of his reasons for which opinion is, that "if the Egyptians had invented their phonetic writing in imitation of the Greek or Roman alphabet, they would naturally have established a number of phonetic signs equal to the known elements of those alphabets, whereas, in different places, different signs are employed to express the same letter." To which, and generally to the notion of the high antiquity of the Egyptian hieroglyphics, the probability of any great discoveries being to be made in them, and therefore the value of M. Champollion's labours, it is replied: "The same thing happens precisely among the Chinese, as already noticed, not two persons writing in their hieroglyphics the same word in the same characters. The transition is by no means so easy as M. C. seems to think. The Chinese have carried their plan of symbolical writing far beyond the point marked by the Egyptians, and have perfected a very curious and ingenious system of combining their symbols, which may be carried to an indefinite extent. Every one of their characters, too, has its sound, though the same sound may equally belong to a hundred different characters; and as it is necessary for a Chinese to know the *sound* of the characters of his language, as well as their *sense,* it is also necessary that he should have some determinate method of accomplishing this. How, then, does he proceed to ascertain the *sounds* of new characters, which are daily brought into use, as old ones are exploded? Not by an alphabet, as Mr C. thinks he has proved the Egyptians to have done, but by a method which, though somewhat more clumsy, is perhaps not less efficient. It is by inserting in the dictionaries, after each character, two others that are well known; the initial vowels or consonants of the first, added to the final vowels or consonants of the latter, giving the sound of the unknown character. For instance, if the two explanatory characters should be *phang* and *tsai*, a Chinese would immediately know that the sound of the character he was seeking was *phai;* if, on the contrary, they stood reversed, as *tsai* and *phang*, the sound of the new character would be *tsang*. The two characters which are thus used to produce the sound of a third are called the *mother* characters, whilst that produced is termed the *daughter*. Such is the resource of this ingenious people to supply the want of an alphabet; and, when we consider how many volumes have been written by them on the subject of their language, and that the Thibetian alphabet is printed in all their books, we must hesitate before we can allow the Egyptians the knowledge of one of the greatest and most important inventions of man—the means of *expressing* sounds and conveying ideas by the combination of a few simple letters. Bearing these difficulties in mind, we should be inclined to think that the letter P must have been introduced into the name of Ptolemy by a Greek, as an Egyptian would naturally have written it *Tolemy*, unless, indeed, it was pronounced *Pe-to-le-my;* in which case they would follow the *sound* by the ear, and write it as a word of four syllables. And precisely in this mode would a Chinese write (conformably with his unaccustomed organs) the English word *strong*, in three distinct syllables, *se-te-long*, over each of which he would place the *sign* of *mouth*, to show it was mere *sound*, and not that *"the magistrate had procured a dragon,"* as three written symbols might be used to express the three syllables which would bear this meaning. Indeed, we are much inclined to believe, that the writing of foreign names in Egyptian hieroglyphics is the invention of the Greeks, who, not to shock the prejudices of the Egyptians, but at the same time desirous of recording the names of their princes on the everlasting monuments, consented to have them engraven in the characters of the country; or that it must have been done by Egyptian artists acquainted with the Greek language, or under the direction of Greeks. M. Champollion, however, seems quite certain he shall be able to show, that long before the arrival of the Greeks in Egypt, the natives made use of the same hieroglyphico-phonetic signs as were subsequently in use; but he adds, "the developement of this valuable and decisive fact belongs to my work upon the pure hieroglyphic writing;" wherein he is to prove, that, at a very remote period, and before the conquest of the country by Cambyses, the Egyptians were in the habit of writing in their hieroglyphic characters the proper names of people, countries, cities, sovereigns, and of individual strangers, the remembrance of whom it was thought important to insert in their historical texts, or in their monumental inscriptions. *Nous verrons.* If he will produce the name of Cambyses, as he has done those of Alexander and his successors, though even this would not prove the fact, we should feel inclined to lean to his supposition; but when he goes so far as to maintain, that the Egyptians furnished the model on which the people of Western Asia constructed their alphabet, merely because all the letters of the Hebrew, the Chaldaic, and Syriac alphabets bear names which are significant, and which the Greeks had adopted from the Phœnicians, we consider this to be wandering into the mazes of theory, and venture to pronounce, that he will lose himself in the inextricable labyrinth."

The natural process by which most, if not all representative languages, attained a degree of efficiency which rendered farther change *unnecessary*, may perhaps be satisfactorily determined. In the first place, it may be held to be incontestable, that spoken language universally preceded written. On this being understood, whencesoever derived or however constituted, and the utility being conjectured, or any way experienced, of having that language, or any portion of it, preserved beyond the period to which, from the nature of the mode in which it was communicated from one person to another, it appeared to be limited, the most likely and obvious measure to be adopted would be that of depicting the object about which it was occupied; and thus outlines or rough drafts would be attempted, of the efficacy of which, to a very considerable extent, we have already had occasion to speak. But these sketches could only be justly and distinctly applicable to those instances in which the objects themselves thus represented were concerned. The abstract qualities and properties of things, with several incidental adjuncts in relation to time and place, would require a notation of a different kind,—one in which the result of common experience and of conventional agreement was comprehended. Thus, the discoverable characteristics and peculiarities of animals and vegetables, of all or any of the objects with which mankind were most familiar, would be had recourse to, or would readily occur to the mind, as affording corresponding suggestions: and hence these objects themselves would be represented as expressive or explanatory, significant or indicative, of the qualities and properties intended to be denoted,—in reality would stand as substitutes for some other objects, or affections and relations of objects. The idea of substitution, once entertained, would speedily lead to practical expedients of the highest utility and convenience; and it is unquestionable, that traces of its operation are to be met with in all known languages, and absolutely constitute a large portion of their poetical resources,—those symbolical adaptations and metaphorical phrases in which the emotions of the heart, the ardent conceptions of the soul, delight to array themselves. Their abundance is one great evidence of the antiquity and originality of a language, and frequently presents the chief difficulty in the way of an interpreter. A few striking examples which occur in the sacred Scriptures may be given.

The *lion*, on account of its great strength and courage, and its being considered the chief of quadrupeds, is used to denote a very powerful man, the chief of his family, or first of a nation, that is, a king;

hence the term, "The lion of the tribe of Judah," the prince who was descended from that tribe. But for a similar reason, only in a bad sense, the term is also applied both to the devil, (1 Pet. v. 8.) and to tyrants, (Job iv. 10—11.) "Christus *Leo* dicitur," says Glassius, "ob fortitudinem et victoriam; Diabolus et tyranni ob atrocitatem et rapacitatem." In the like two-fold manner, the term *unicorn*, as is noticed by that author, "metaphorice ad pios transfertur, ob fortitudinem et robur; et ad impios et persecutores, ob audaciam et virulentiam." Thus, says the Psalmist, as in the person of the Messiah, (Ps. xxii. v. 31.) "Save me from the lion's mouth: for thou hast heard me from the horns of the unicorns;" or rather as Horsley translates the passage;

"Save me from the mouth of the lion,
And from the horns of the unicorns."

In this psalm we find the terms *bulls* and *dogs* used in reference to the same enemies of the Messiah; and in Isaiah, (ch. xxxiv. v. 5—8.) where the vengeance of the Almighty is threatened against the oppressors of his people, similar metaphors are employed, thus; "The Lord hath a sacrifice in Bozrah, and a great slaughter in Idumea. And the unicorns (probably the rhinoceros is meant) shall come down with them, and the bullocks with the bulls, and their land shall be soaked with blood, and their dust made fat with fatness. For it is the day of the Lord's vengeance, and the year ef recompences for the controversy of Zion." On the expression of Paul, (1 Cor. xv. v. 32.) that he had "fought with wild beasts," Scaliger has probably with justice remarked, "Feros et praefracti ingenii viros, quibus cum illi negocium et contentio fuit, vocat θηρια;" and, accordingly, in place of, "if, after the manner of men I have fought," &c. he proposes, unnecessarily indeed, and without authority, a slight alteration in the Greek text, by which we shall read, "if, against men, I have fought," &c. Paul does not scruple to quote the character of the Cretians as "evil beasts," (Titus i. v. 12.) and of a certain description of persons, enemies of the truth, he counsels the Philippians to *beware*, (ch. iii. v. 2.) In the same style Christ says, he "sent out his disciples as sheep in the midst of wolves," (Matt. x. v. 16.)—and it is one of his precepts or admonitions to them, "not to give that which is holy unto the dogs, neither to cast their pearls before swine." (ib. ch. 7. v. 6.) The crafty Herod he denominated "a fox," (Luke xiii. v. 32.) and the Pharisees, "a generation of vipers," (Matth. xii. 34.) The compound word *Ariel*, signifying "Sion of God," is given to the city of Jerusalem by Isaiah, (ch. xxix. v. 1, 2.) probably on account of the vast number of animals consumed in the sacred feasts of the temple there; and Ezekiel, describing the new temple, uses a similar expression for the altar of holocausts, (ch. xliii. v. 15, in the Hebrew text, and marginal translation.) Many examples of metaphors and symbols might be adduced, as is well known to every biblical reader. Those who wish for a complete enumeration of them, may consult the admirable work of Glassius, *Philologiae Sacrae, Lib. Quint.* Of the number and nature of the metaphors used in Scripture, some idea may be gathered from the classification of them therein given; but even as to this we must content ourselves with quoting only the more general heads, and stating that each of them contains a great variety of instances. Metaphors are taken from GOD, his name, character, and actions: ANGELS,—their qualities, distinctions, and orders: HEAVEN,—its constitution and ornaments: The ELEMENTS,—light, fire, air, water, earth, in all their varieties of appearance and operation: MINERALS, PLANTS, and ANIMALS,—three very wide and multifariously comprehensive regions: MAN,—the human body and its members, the things which relate to its animation and support, the senses, the various distinctions among mankind, namely, sex, age, and relations, their actions, situations, and habitations, numerous internal and external adjuncts: SACRED PERSONAGES and THINGS,—man, places, and rites, officially and typically dedicated to God.

In order to illustrate the mode of interpreting symbols, as well as to shew the caution required in it, we shall select a single example more; and we take it with the accompanying extract from a short but judicious article in the Classical Journal, (Vol. II. p. 544.) The firmament, being conceived to be elevated above the earth, signifies the most exalted station or rank in society; the *sun* as being the most splendid of the heavenly bodies, symbolizes *supreme power*; and the *moon* and *stars* point out derived and subordinate power. But here it is necessary to guard against mistake. "A careless reasoner will be apt to conclude, that when the sun is put for the *supreme rule*, the moon must symbolize *the queen*; and he will not fail to recollect, that in Joseph's dream, the sun symbolized the father, the moon the mother, and the stars the sons. In the case of a family, these symbols could with no kind of propriety be taken in any other sense; but it is quite otherwise in respect to a kingdom, or empire, and it is so from that necessity which determines the fitness of things. The hieroglyphic of the luminaries embraces a totality which must not be violated in any case to which it may be applied; the moon, therefore, cannot signify the queen, as it would follow that a kingdom or empire cannot exist without a queen as well as a king. In fact, the sun does not symbolize the sovereignty as *a male*, or as any thing but the *supreme power*, whether vested in a male or female or a plurality of persons. A queen, then, if supreme, may be symbolized by the sun,—in this case what would become of poor *Luna?* Consider the compound symbol, and then the parts of the complex machine to which it is applied. If the sun symbolize the sovereignty, and the stars inferior magistrates, what also remains of the political fabric to be symbolized? Only people, *the subjects*. A queen, considered merely as the king's wife, is not necessary to the existence of an empire, and, therefore, cannot be embraced by any portion of a symbol that is to be so applied, except as one of the subjects. By what argument, then, can it be shewn, that in the symbol of the luminaries the moon is applied with equal propriety to a man's wife, when a family, as to the people where a kingdom is intended? By a very obvious analogy, the man's wife is symboliz-

Representative Language.

ed not as a wife, but *as a subject*; for such is the order appointed by the supreme ruler of the universe, an order from which the inhabitants of the east, the parents of hieroglyphics, have not deviated, even to the present time. It is deserving of notice, that the eminent astrologers, in solving political questions, seem to have been guided entirely by symbolic indications. They always considered the sun as representing the government, or ruling power, and the moon as symbolizing the people, or subjects; but in domestic questions, as in Joseph's dream, the sun represented the husband, and the moon the wife, because subject to him. And here, it may be remarked, for the analogy is striking, that Artemidorus stated that a *lamp-stand,* (commonly rendered *candlestick* in the English Bible,) symbolizes *a wife,* for which he assigns this reason, that *as a lamp,* or *the light thereof,* signifies the *master of the house,* because he superintends it, so the *lamp-stand* signifies his *wife, over whom he rules and presides.*" It is well remarked by this writer, that each symbol has a precise and determinate signification, and that "until this be ascertained with respect to any one specified, it will be absolutely impossible to settle its peculiar signification in combinations which necessarily affect the features, though not the radical sense of the symbol." And afterwards, insisting on the necessity of distinguishing between metaphors and symbols, he justly remarks, "In hieroglyphical language it is not left to fancy or to sagacity to attach to a symbol any signification which the reader may imagine would have been more appropriate than that assigned to it by the ancients; for, in elucidating such writings, our business is not to *make a language,* but *to read one already made*; and we might as well refuse to any word, in Hebrew, Greek, or Latin, its known and admitted sense, from a conceit that a more expressive word might have been formed to convey that idea, as quarrel with the meaning of a hieroglyphic because, in our judgment, a more appropriate one might have been formed. But this is in fact the line of conduct that has been followed by the greater part of the expositors of prophecies. They have confounded symbols with metaphors; and because the figures employed in the latter, according to their various combinations, admit of various significations, have used the freedom to assign meanings to the former not recognised by the ancients, and therefore inadmissible. Where symbols are employed, it is the duty of an expositor, instead of resorting to fancy, to employ industry, not to make but to find out the admitted sense. In Daniel and John, many of the symbols they employ are explained; the meaning of others may be found in other prophecies, and, when those fail, recourse should be had to profane authors. Nor is there more danger in seeking the meaning of a symbol in such works than in ascertaining the sense of any word in the New Testament, by comparing the best Greek writers with each other." It is unnecessary to say, that thousands of examples of the use of symbols may be found in profane authors, or to quote any of them in order farther to point out their nature. In all of them, it will be observed, the correspondence or comparison intended is between the things themselves, and not the terms which signify them; or, to express the matter otherwise, relates to the thought, and not to the words in which it is conveyed. The principles of resemblance and relation, in whatever these may consist, seem essential to the whole of them; and on this account, as well as because they evidently supply the place of proper terms, they might be considered under one head with what the rhetoricians denominate by the general terms *tropes* and *figures of speech*; of which, considered, in reality, as *intellectual hieroglyphics,* and availing ourselves of the title Representative Language, we may here treat, as far as is requisite for general use.

Representative Language.

Tropes and figures of speech are distinguishable, in that the former chiefly affect words, by one of which they convey two ideas to the mind, one of the kind expressed, and the other that to which it has a respect, and that they are designed to represent our thoughts; whereas figures affect whole sentences, causing them to vary from what may be reckoned the usual manner of expression, and represent passions and emotions. Of the kind of tropes, besides the *metaphor,* the sole relation of which is resemblance, may be mentioned the *synecdoche,* in which the relation is that subsisting between the whole and a part, the genus and the species, or the matter itself and the thing arising from it; the *metonymy,* the relation of which is that of cause, effect, or adjunct; and *irony,* of which the relation is simply that of contrariety. Of these we shall treat in order, but very briefly.

Metaphor, considered by Cicero "the most florid manner of expression, and brightest ornament of language that consists in single words," is, in reality, according to that author, "a similitude reduced to a single word," or may be defined "a trope which changes a word from its original and proper signification to another, in consequence of, or in order to express, a resemblance between them." It differs from what is usually styled a similitude only in not having terms or signs of comparison. Thus, to say of a man that "he is a lion," is to employ a metaphor; whereas the expression, "he behaves, or acts like a lion," is a similitude. Metaphors are of four kinds, as, 1. When the resemblances are between animate beings or their qualities, characters, and actions, of which we have an example in the joke of Cicero: "My brother being asked by Philip why he barked so, answered, because he saw a thief," where *barking,* the property of a dog, is applied to a man: 2. When they relate to inanimate beings, whether these be natural or artificial, as we say "floods of fire and clouds of smoke," intending thereby large quantities of both: 3. When terms or expressions regarding inanimate beings are applied to animals, on account of similar properties observable between them, as Ajax is called by Homer "the bulwark of the Greeks;" and, 4. Where the actions and attributes of animals are predicated of inanimate beings, of which we have an example in the same poet, when he applies the term *winged* to words, meaning thereby the swiftness of speech.

A *synecdoche,* or that trope by which "either the whole of a thing is put for a part of it, or a part for the whole," may be of six kinds,—as, 1. Where the genus stands for the species, of which we have an instance in the commission of Christ to his disciples, "to preach the gospel to *every creature*," meaning thereby *every rational creature*; 2. Where the species is put for the genus, as when a man is said to "gain his *bread* by his labour," bread here signifying any food or nourishment by which his life is supported: 3. When the material or essential whole of a thing denotes one of its parts, as is said on monumental inscriptions,—"Here lies such an one," meaning his body: 4. Where the substance of which a thing consists is put for the whole being, as we speak of "having so much silver or gold," in place of so much money made of those metals: 5. When the whole of any material thing or quantity stands for a part, as the expression "the whole world" to signify a certain region or country, or, as is noticed by Ward, from whom these examples are abridged, when our Lord spoke of his being "three days and three nights in the heart of the earth," (*Matt.* xii. v. 40.) though he remained in the grave only part of the first and third day, and the whole of the second day, with the whole nights between: and, 6. Where a part of any material thing or quantity is put for the whole, as we say of a fleet that it "consists of so many *sail*," meaning so many ships.

A *metonymy* is defined by Vossius "a trope which changes the names of things united naturally, but in such a manner that one is not of the essence of the other;" in which case the words so used change their sense, and denote something different from their proper significations. This will be easily understood by considering the four classes of metonymies,—as, 1. Where the *cause* is put for the effect, of which we have two kinds, namely, where the cause is *efficient*, and where it is *final*, according to the language of logicians. As an example of the first, the inventor, discoverer, or author of a thing is sometimes put for what he invented, discovered, or made. Thus *Ceres* for *corn*, the use of which she is supposed to have introduced; and thus it is said in the parable of the rich man and Lazarus, (*Luke*, xvi.) that the brethren of the former "have Moses and the prophets," meaning the books *written* by them; and of the second, or metonymic of the final cause, where the end in doing a thing is put for the thing done, is this phrase, "the watch is set," meaning the watchmen appointed for the purpose; and, again, the line in Virgil, (*Eclog.* x. v. 41.)

Phillis should *garlands* crop,

by which he means *flowers* to make garlands. 2. The effect may be put for the efficient cause, whether that be the agent or only the means and instrument; as where the same poet styles the two Scipios "the destruction of Lybia, (*Æn.* vi. v. 844.) because they were the agents who occasioned it; and Horace speaks of Mæcenas as "his guard and honour," (*Cant.* lib. i. l. 2.) that is, his guardian and the author of his honour. 3. The subject is sometimes put for the adjunct, understanding by the first term that wherein some other is contained, or about which it is conversant, as also the possessor considered in relation to the thing he possesses, and the thing signified when used for the sign. Thus, the seat of any faculty or affection may be mentioned in place of the faculty or affection itself. So Ward remarks, it is usual to say, "a man of a clear head," when we mean a clear mind or understanding, the seat of the mind being in the head. And a person is said "to have a warm heart," because the heart has been thought the seat of the affections. As an instance of the object being put for the person or thing employed about it, Cicero says, "In time of battle the laws are silent;" (*Pro Milon.* c. 4.) intending by the term *laws* the judges who pronounce sentence according to law. The possessor is put for the thing possessed in the phrases to "devour, destroy, or ruin a *man*," meaning his *estate*; and the thing signified is put for the sign, "when statues and pictures, or other representations, are called by the names of the persons and things represented." The Popish doctrine of transubstantiation is founded upon an abuse of this trope; for when our Saviour, speaking of the bread and wine at that time before him, says, "This is my body, and this is my blood," his plain meaning is, they were the signs of his body and blood, the thing signified being put for the sign by this sort of metonymy. "But the Papists take the expression literally, which must doubtless be very absurd, since the words relate to the time then present, while Christ was yet living, and spoke them, when it was impossible for the bread and wine to be converted into his body and blood, it being evident to all who were present that those elements and his body existed separately at the same time. But if the words are explained by this trope, the sense is plain and easy, and the way of speaking familiar to all writers; whereas they who plead for the literal sense might, with equal reason, assert that those expressions are to be taken literally in which several parts of the human body, as the hand, the arm, the ear, and the eye, are ascribed to the Deity; or that, when our Saviour, in a metaphorical sense calls himself *a vine*, and *a door*, (John xv. 5. x. 7.) these words were designed to be applied to him strictly and properly, and not by way of similitude only, as is the case in all metaphors." 4. As examples of the adjunct being put for the subject, may be mentioned the expression in Virgil, (*Æn.* I. v. 724.,) "They crown the wine," meaning the bowl containing the wine,—the ancients being accustomed to deck their bowls with garlands at their entertainments; the saying of Solomon, "hope deferred makes the heart sick," hope signifying the thing hoped for. Again, where a thing done is put for the time in which it was done, as "he has served so many campaigns," meaning so many summers or seasons in which armies are usually taken into the field; and where the sign stands for the thing signified, as *the sceptre* for the *royal dignity*, and the *sword* for the *authority of the magistrate.* Two other kinds of metonymy have sometimes been specified, namely, those of the *antecedent* and the *consequent*, which bear some analogy to the cause and the effect. Of the first we have an example, when, *to hear*, spoken of a superior, signifies to *grant* or *comply with*, and of an inferior *to obey*; and of the latter, in the phrase *to subscribe, or set one's hand to a thing*, used to mean *giving assent*, or *agreeing to it.*

Irony has been briefly defined "a trope in which one contrary is signified by another;" but better by

Dr Johnson, "a mode of speech in which the meaning is contrary to the words." According to Quintilian, it may be known by one of three ways; as the manner of the pronunciation, the nature of the person, and the nature of the thing; for, where any one of these does not agree with the words, it is clear that the contrary of what is said is intended. The subjects of it are vices and follies of all kinds, and it is often more effectual than serious reasoning in exposing them. We have examples of it in the sacred Scriptures. Thus Elijah treats the prophets of Baal, when he bids them prove his deity: "Cry aloud, for he is a God; either he is talking, or he is pursuing, or he is on a journey, or peradventure he sleepeth, and must be waked," (1 Kings, xviii. 27.) Nay, our Saviour himself, says Ward, thought fit thus to reprove the Jewish doctors, when he says, "Full well ye reject the commandment of God, that ye may keep your own tradition;" where, by the words *full well*, or as it is in the original, καλῶς, it is very evident,' that a severe reprimand was intended." Irony is used on a variety of occasions, which Ward exemplifies out of Cicero;—as in the way of jest and banter, thus: "We have much reason to believe the modest man would not ask him for his debt when he pursues his life," (*Pro. Quint. c.* 11.)—by way of insult and derision, as when he means to represent the forces of Catiline mean and contemptible: "O terrible war, in which this band of rakes are to march under Catiline. Draw all your garrisons against this formidable body," (*In. Catil.* II. *c.* 11.)—to give greater force to argument, as, "But it is foolish in us to compare Drusus, Africanus, Pompey, and ourselves, with Clodius; all our calamities were tolerable, but no one can patiently bear the death of Clodius;" (*Pro. Mil. c.* 8.)—the character of Clodius being well known such that all present must have been sensible the contrary was meant by the orator. These instances may suffice to shew the nature of irony; and with them we finish our account of the primary tropes. What we have to deliver on the subject of the secondary tropes and figures is a list of their rhetorical names and significations, illustrated with examples.

Antonomasia is of the nature of a synecdoche, and signifies the use of a common or general word for the proper name of a particular person or being, on any account remarkable, or the use of a proper name for some thing or person of a similar character, as, "he is gone to *the city*," meaning *London*; the word "Gospel" for any certain and undoubted truth; "Hercules" for a strong man, and "Solomon" for a wise one, "Cicero" for an orator.

Communication, also a species of synecdoche, denotes an entire change or commixture of persons and things, as when an orator ascribes the praise of an action to his hearers, thus, "*ye* (not we) *did so and so*;" or, on the contrary, in blaming, apparently excludes them, thus, "*we* (not *ye*) *have done it*;" or, again, comprehends or excepts them in speaking favourably or unfavourably of the virtues and vices of others.

Litotes, which may likewise be referred to the synecdoche, is a mode of speech in which, under the form of a denial, the contrary is intended, and that in a high degree; as, "I do not commend you for that," meaning "I blame you much;" or, when Cicero says of Cotta that he was "no mean orator," signifying, as he elsewhere called him, "a very great orator;" and the expression in Matt. ii. v. 6. quoted from a prophet, "Thou, Bethlehem, in the land of Judea, art not the least among the princes of Judea," where the *greatest*, or *very great* is intended, on account of its giving birth to the Saviour.

Euphemism is the substitution of a term which expresses something more soft or agreeable than what is really signified; and as this may be done by using a word either contrary to, or only different from another, this trope may be either irony or a synecdoche; as, of the former sort, when, according to the Latin phraseology (*valeat*) we say of a person, "fare him well," though the contrary is meant; and of the later, when speaking of the death of any one, also according to the manner of the Latins, (*decessit* and *abiit*,) we say, "he is deceased or departed."

The term *catachresis* signifies any harsh trope, generally of the nature of a metaphor, as, "the blood of the grape" for its juice; or, when Solomon says of the leech, that it "hath two daughters," meaning two orifices, by which it seems to suck. It is a metonymy in the case of John, (Revel. i. v. 12.) "I turned to *see the voice* that spake to me;" and an example of irony, when we say of a criminal, "he has got his reward," meaning he has been punished.

Hyperbole is a trope which transgresses the bounds of truth, either by exaggeration or diminution, and representing things either better or worse than they are, but in such a manner as not to impose on the hearers. In the case of increase, it is termed *auxesis*, and in that of defect, *meiosis*. Thus, of the former, "Such a thing reaches to heaven," meaning "is very high;" and of the latter, "such a person is a mere skeleton," that is, "he is very lean." It is obvious, that a hyperbole may be either a metaphor, as when Saul and Jonathan are said to have been "swifter than eagles and stronger than lions," or a metonymy, as when Velleius Paterculus speaks of Cato, as "the image of virtue;" a synecdoche, as when Moses says of certain places, that they were "cities fenced up to heaven;" and irony, when a weak-sighted person is said to be "eagle-eyed."

Metalepsis relates to the employment of two or more tropes, of a different kind, under one word or phrase, so that several gradations or varieties of sense intervene between the word expressed and the thing signified; as, when Sylla, observing the aspiring genius of Julius Cæsar, then a young man, said of him, "In one Cæsar there are many Mariuses," intending, by employing the proper name Marius for an ambitious and turbulent person, that Cæsar would prove most dangerous to the commonwealth. The words of Dido (*Æn.* iv. 664.) afford a fine example, as commented on by Ward:

"Happy, and truly happy, had I been,
If the Trojan ships our coasts had never seen."

In this expression, first, by a metonymy of the adjunct, the ships are put for the Trojans in the ships, and then by a synecdoche of the whole for Æneas, who was one of them; and, again, his arriving on the coast, by a metonymy of the cause for her seeing him; and, lastly, her seeing him, by the same trope, for the passion she had for him. So that her meaning is, she had been happy if she had never entertained a passion for Æneas."

Allegory, considered as a trope, denotes the employment and continuation of several tropes, generally metaphors, in one or more sentences, as Cicero says, (*Pro Muraen. c.* 8.) "Fortune provided you no *field,* in which your virtue could *run* and display itself." A well known example of metonymical allegory is given in Terence, "without Ceres and Bacchus, Venus grows cold," that is, without the tropes, "without meat and drink, love dies." An allegory made up of synecdoches is presented in Samson's riddle, "Out of the eater came forth meat, and out of the strong came forth sweetness," (Judges xiv. 14.) Fables are a species of allegory.

In the sense in which it is used by the rhetoricians, the term *figure,* borrowed from the stage, where certain habits and gestures (called by the Greeks σχήματα and by the Romans *figurae,*) different from those of ordinary life, are assumed by the actors, signifies a mode of speaking intended to be more beautiful and emphatic than the usual manner of expressing the same ideas. The following account of their origin and utility, abridged from Ward, will shew very satisfactorily the connection of natural with this species of representative language. If we consider the nature of speech, we shall easily perceive, that as mankind must have been under a necessity, very early, to introduce the use of tropes, for supplying the want of proper words to express their simple ideas, so the like necessity must have put them upon the use of *figures* to represent their different passions, though both of them were afterwards increased and improved in such a manner as to become the chief ornaments of language. The passions of man have been always the same; they are implanted in us by nature, and we are all taught to discover them by the same way. When the mind is disturbed, we shew it by our countenance, by our actions, and by our words. Fear, joy, anger, alter the countenance, and occasion different emotions and gestures of the whole body; and we know with what passion a man is affected by hearing his words, though we do not see him. He does not express himself as he usually does, at other times, when cool and sedate. Objects appear to him in a different view, and therefore he cannot but speak of them in a different way. He interrogates, he exclaims, he admires, he appeals, he invokes, he threatens, he recalls his words, repeats them, and by many other different turns of expression varies his speech, no less than his countenance, from his common and ordinary manner. Now, as Nature seems to teach us, by those figurative expressions, how to represent the different commotions of our minds, hence some have thought fit to call *figures the language of the passions*; and as these are given us, among other wise ends, to assist us the better to provide for our preservation and safety, this is done sometimes by force of arms, and at other times by discourse. And therefore Cicero very handsomely compares the conduct of an orator to the resources of the *palaestra,* in which, as each combatant endeavours not only to defend himself, and attack his adversary, but likewise to act both with decency, so the principal weapons of an orator, as he represents them, are *figures,* which, being no less the ornaments of language than images of our passions, answer all these purposes. Besides, figures chiefly distinguish the different kinds of stile, furnish it with an agreeable variety, and often serve to represent things in a clear and forcible manner. "They are a sort of natural eloquence, which every one falls into without attending to it, suitably to that temper of mind with which he is affected himself and is desirous to affect others."

Figures are of two kinds, those of words and those of sentences; and the difference between them is discoverable in this, that if the words in the former be altered, the figure is destroyed, whereas, in the latter, it remains, whatever words are made use of. As verbal figures, or figures of words, may be mentioned, 1. Two, in which there is a deficiency of words, viz. *Ellipsis* and *asyndeton*; the first of these being where one or more words are wanting in a sentence to complete its construction and fully express the sense, as, "many men, many minds;" and the second denoting the case in which the particles that connect sentences are omitted, in order to represent celerity, or to shew the eagerness of the speaker, as Cæsar's pithy bulletin on his victory over Pharnaces, "I came, I saw, I conquered." 2dly, Two in which there is a redundancy or multiplicity of words, viz. *pleonasmus* and *polysyndeton*; the first where more words are used than are necessary to express the sense, as, "I saw it with these very eyes;" and the other where particles and connecting words are multiplied, as, "They had ships, and men, and money, and stores, and all other things." 3dly, The *repetition,* which may be of the same word in sound or sense, or one of like sound or sense, or both. There are, accordingly, as many varieties of this verbal figure; thus, of the first sort, the *antanaclasis,* where the same word in sound but not in sense is repeated, as in the words of the Lord, (Matt. viii. 22.) to one who desired to be allowed to go and bury his father, "Follow me, and let the *dead* bury their *dead;*" both a natural and a moral or spiritual death being thereby intended:—the *ploce,* where the name of some person or thing is repeated in order to denote a particular character or property, as, "An *ape* is an *ape* dress him never so fine:"—the *epizeuxis,* when a word is vehemently or earnestly repeated in the same sense, as, "O, Jerusalem, Jerusalem, who killest the prophets," (Matt. xxiii. 37.):—the *climax,* when the word which ends the first member of a period begins the second, and the same form is repeated throughout the whole, as, "There is no enjoyment of property without government, no government without a magistrate, no magistrate without obedience, and no obedience where every one acts as he pleases:"—the *anaphora,* when several sentences, or members of a sentence, begin with the same word, as in Cicero against Cataline, (i. c. 3.) "Does neither the night-guard of the palace, nor the city watch, nor the peoples' fear, nor the agreement of all good men, nor the meeting of the senate in this fortified place, nor the countenances and looks of this assembly, at all move you?"—the *epistrophe*, where each sentence or member of a sentence ends with the same word, as, where the same orator, addressing the senate, speaks against Mark Antony, (*Phil.* ii. c. 22.) "Do you lament the destruction of three Roman armies? The author of that destruction was Antony. Do you bewail the loss of most eminent citizens? They have been taken from you by Antony. Is the authority of this order weakened? It is weakened by Antony:"—the *simploce*, which comprehends both of these figures, as is beautifully exemplified by the apostle Paul, when comparing himself with others, (2 Cor. xi. 22.) "Are they Hebrews? So am I. Are they Israelites? So am I. Are they the seed of Abraham? So am I:"—the *epanalepsis*, where a sentence ends with the word with which it commenced, as in the compliment made by Cicero to Cæsar, (*Pro. Marcell.* c. 6.) "We have seen your victory terminated by the war; your drawn sword in the city we have not seen:"—the *anadiplosis*, where a word which closes a sentence begins the following, as in John, (i. v. 11.) speaking of the Messiah, "He came to his own, and his own received him not:"—and the *epanodos*, which is the inversion of a sentence, or the repetition of it backwards, so that it comprehends the two last named figures, exemplified in Isaiah, (v. v. 10.) "Wo unto them who call good evil, and evil good; who put darkness for light, and light for darkness." Of figures in which there is a repetition of words of a like sound or signification, or both, there are four kinds,—the *paronomasia*, (usually called a *pun*,) in which two words, nearly alike in sound but different in sense, are employed in relation to each other in the same sentence, as, "After a feast comes a fast:"—the *homoioptoton*, when the several parts of a sentence end with the same case or tense, of a like sound, as, "No marvel though wisdom complains that she is either wilfully despised or carelessly neglected, either openly scorned or secretly abhorred:"—the *synonymia*, where words of the same import, or having a near affinity, are put for one another, as Cicero, speaking of Piso, says, (*Gell.* lib. xiii. c. 24.) "His whole countenance, which is the tacit language of the mind, has drawn men into a mistake, and *deceived*, *cheated*, *imposed* on those who did not know him:"—and, lastly, the *derivatio*, when words which have the same root come together in the same sentence, as, "He wished rather to *die* a present *death* than to *live* a miserable *life*."

We have now to treat of *figures of sentences*, which may be considered as twofold, viz. as adapted to reasoning, and as suitable for moving the passions. Of the first kind are *prolepsis* or *anticipation*, as when an objection is started for the purpose of being answered, so as to be before-hand with an adversary, or to conciliate an audience; thus Cicero, who had for several years been for defendants, on becoming the accuser of Verres, thought proper to commence his oration with, "If any one present should wonder," &c. proceeding to state that fact, and to explain it:—*Hyperbole*, or *subjection*, which is like prolepsis, and occurs when several things are mentioned as apparently for the contrary side of a cause, and are refuted in order, as in Cicero's defence of Plancius, in which he introduces his adversary objecting, and himself as answering, "The people judged ill, but they did judge: they should not have done it, but they had a power: I cannot submit to it, but many very great and wise men have:"—*Anacoinosis*, or *communication*, where the speaker deliberates with the judges, with the hearers, or with his adversary, as in the case of the prophet Malachi introducing the Almighty as thus speaking: "A son honoureth his father, and a servant his master. If then I be a father, where is mine honour? and if I be a master, where is my fear?"—*Epitrope* or *concession*, where one thing is granted in order to obtain another, and this may be either real or feigned; thus Cicero defends Ligarius, accused by Tubero of joining with Pompey against Cæsar in the civil war, "You have, Tubero, what an accuser would most desire, the accused person confessing the charge, but so as to affirm that he was of the same party with you and your excellent father. Therefore, own first that it was a crime in yourself, before you charge it as such upon Ligarius:" and when the same orator, defending Flaccus, intercedes for him on the ground of his good services, saying, if these are to be overlooked, "Let us appease the ghosts of Lentulus and Cethegus, let us recal those who are in exile, and let us be punished for too great affection and love for our country:"—The *parabole*, or *similitude*, in which a thing is illustrated by comparison with another which resembles it, as "What light is to the world, so is knowledge to the mind:" And *antithesis* or *opposition*, in which a comparison is instituted between things which differ and are contrary, as, "The Roman people hate private luxury, but love public grandeur." (Cicero *pro Muraen.* c. 36.)

The figures which are more peculiarly suitable to moving the passions are, the *epanorthosis*, or *correction*, by which a speaker recalls or amends what he has said, as the old man, in Terence's *Self-tormentor*, bewailing the absence of his son, says, "I have an only son, Chremes. Alas! did I say that I have? I had indeed," &c.—*Paralepsis* or *omission*, where the speaker seems to pass over what he actually declares, as Paul in addressing Philemon, "I do not say to thee how thou owest unto me even thine own self besides:"—*Parrhesia*, or *reprehension*, when admonition or reproof is artfully and agreeably conveyed, or so as to imply a compliment, as Cicero addressing Cæsar, "I hear that excellent and wise saying from you with concern, that you have lived long enough either for the purposes of nature or glory," &c. (*Pro Marcell.* c. 8.)—*Aparithmesis*, or *enumeration*, where what has to be expressed, in place of occupying only a few words, is branched out so as to enlarge the ideas and make them more affecting, as when Cicero endeavours to excite compassion for Milo, "See, how various and changeable is the state of human life, how unsteady and voluble is fortune!" &c.—*Exergasia*, or *exposition*, which consists in the employment of several equivalent, or nearly equivalent expressions, to represent the same thing energetically, as Cicero, justifying self-defence, in his speech for Milo, "If reason prescribes this to the learned, and necessity to barbarians, custom to nations, and nature itself to beasts, always to ward off," &c.—*Hypotyposis*, or *imagery*, such a description of things as aids the mind to conceive them to be present, as the same orator painting the horrors of Catiline's design, "Methinks I see this city, the light of the world, and citadel of all nations, suddenly falling into one fire; I perceive heaps of miserable citizens unburied in their ruined country," &c.—*Aporia*, or *doubt*, expression of hesitation and difficulty of mind on some pressing matter, as, in his speech for Cluentius, Cicero says, "I know not what way to turn myself. Shall I deny," &c.—*Aposiopesis*, or *concealment*, where a person stops in the middle of a sentence, as if prevented from expressing what he intended; thus Virgil makes Neptune interrupt himself in his threats against the winds, (*Æn.* lib. i. v. 13.) Whom I—but first I'll lay the storm."—*Erotesis*, or *interrogation*, when a thing which might easily be expressed in a direct manner is put in the form of a question, as Cicero inveighing against Catiline, "How long will you abuse our patience? Do not you perceive your designs are discovered?"—*Ecphonesis*, or *exclamation*, an extension of voice, produced by a commotion of mind, as the words of Paul, "O death, where is thy sting! O grave, where is thy victory!"—*Epiphonema*, or *acclamation*, used when a speaker, closing his argument, makes some lively or spirited observation on what he has been saying, so as more vividly to affect his hearers, as, describing an instance of cruelty and unfaithfulness in friendship, Cicero says, "Hence we may learn that no duties are so sacred and solemn which covetousness will not violate." (*Pro. Quint.* c. 6.)—*Apostrophe*, or *address*, where the speaker, breaking off his discourse, directs himself to some particular person or thing, whether present or absent; so Isaiah, (i. v. 2.) "Hear, O heavens, and give ear, O earth, for the Lord hath spoken it."—*Prosopopeia*, or the *fiction of a person*, was formerly treated at large.

III. By the adoption of the terms ARBITRARY, ARTIFICIAL, or even CONVENTIONAL, it may be inferred that we assume the truth of the theory which ascribes language, taken in this sense, to the invention of mankind, in opposition to the theory which considers it of divine origin. But, in reality, we think that question an idle one; and the title has been chosen merely for distinction sake, and because, whichever of these two opinions is entertained on the subject, it must be admitted that there is not a spoken or a written language now in existence that is naturally expressive, or that does not require convention on the part of man, and consequently some process of education, in order to be understood. Whether there ever was a language in the world of a different kind, and the elementary members of which were in themselves significant, in such a manner as the constituents of natural language, is a point which, it may be safely said, can never be ascertained, but which, without by any means denying its possibility, may be reckoned improbable. Perhaps the nearest approach to such a correspondence between the signs of a language and the things denoted by them, is that which is imagined by some writers to have resulted from hieroglyphics. The progress of this supposed result is well described by Goguet.

According to him, when hieroglyphic writing, simply considered, had been carried to its highest perfection, as, for example, among the Egyptians, there remained one great and last effort to be made to discover characters proper for representing words independently of objects; and, for this effort, he seems to think there would not be wanting some happy and inventive spirits; because, he says, there have been in all ages such individuals "raised up by Providence for the improvement and increase of human knowledge." Now, some of these would take notice of the great imperfection of the existing methods of rendering the thoughts of the mind visible and permanent, so as to be readily communicated to others; they would perceive the inconveniences to which these methods were liable, and, in particular, their exciting double ideas in the mind, "by a confused mixture of words and objects;" and they would farther remark, that the articulate sounds of the voice in speaking were not very numerous. It might now occur to them to represent these articulate sounds by a corresponding number of signs; and, in this manner, it is imagined they might propose to paint words by signs, which bearing a direct relation, though, of course, no resemblance, to the sounds used in speaking, would present no other idea to the mind. These signs, then, would represent words, not objects, and, if taken separately, would signify nothing except sounds, but, when joined together, would form a precise determinate number or series of words, each component sound of which would be represented by a particular sign. Goguet calls this way of writing *syllabic*; because, according to him, it would have only one character for each syllable of a word: and such he conjectures to have been the first step that would be made to represent words otherwise than by painting objects. He suspects it to have been used by all those nations which were anciently denominated Syrians and Assyrians, but by few others of the old world; and among the moderns, only by the Ethiopians, and some people of India. It is obviously a most imperfect method of communicating thought, and by the multitude of characters which it would require, must have been so excessively burdensome to the memory that it could not be either correctly or easily practised.

Goguet goes on, then, to point out the subsequent and superior invention of expressing vowels and consonants by so many distinct characters, and the great excellence of which consists in its simplicity. But, "how," we may well ask with him, "did mankind arrive at this discovery? How did they pass from hieroglyphics, and even syllabic writing, to alphabetic characters?" It is, indeed, hard to be conceived, he admits; for neither the one nor the other of these systems has the slightest relation to what we call letters. The nature of the signs made use of, accordingly, is imagined by him to have been entirely changed; and knowing it to be vain to have recourse to any ancient authors for an answer to the question, he satisfies himself with stating it as probable, that the contracted kind of hieroglyphics, in which part of the thing was used sometimes for the whole. or one thing for another, might lead to the more contracted method of alphabetic letters,"—a conjecture which he conceives to derive support from the fact of the letters of certain ancient alphabets appearing as if they had been taken from hieroglyphic signs. He instances some of the Egyptian letters which still remain, and the resemblance between them and the hieroglyphic figures found upon the obelisks and other monuments of antiquity. This is a point about which, we conceive, there can be no doubt since the confirmation it has recently received from the inquiries into the literature of ancient Egypt, the vulgar character of which probably had its origin in the picture-writing of earlier times, as the resemblance becomes more and more distant, in proportion to the remoteness of the period of the writings from the age of the hieroglyphical archetype. "In some rolls of Papyrus," says Sir William Hamilton, (*Ægyptiaca*, Appendix, Note A.) "almost every letter bears a faint resemblance to some visible object, as an eye, bird, serpent, knife, &c., whereas in others it is very difficult to trace it."

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These NINE WORDS, which are verbs of an interjectional nature, are supposed the foundations of all the conventional languages known to have existed in Europe; and how extensively and usefully they might be modified it is easy to shew, it being recollected that the circumstances of the action would be communicated by gesture, and the tenor of the voice. First, they might be repeated: Thus AG! AG! AG! would denote the action violent and terrible: AG, AG, AG, AG, that it was done frequently, or in a great degree. Secondly, they might be used in all the extent of the imperative mood; as Dwag, Dwag, drive, drive; NAG, knock, crush; MAG, MAG, kill him, "murder him by bruising." Thirdly, as each quality of an external object would be considered an agent, the character of its actions would suggest the appropriate monosyllable; and thus nouns and adjectives, as well as verbs, relative to that quality, would be formed at the pleasure of the speaker, as the act, the actions, and the effect of the action, must all be denoted by the same word. Hence AG would signify not only the action of fire, but also fire itself, and its bright or penetrating quality; as water, when yielding to slight pressure, was WAG, and, when it rushed in a stream, RAG. Fourthly, these monosyllables might be compounded, or put together, in a great variety of ways. Thus BAG, WAG, bring water; DWAG LAG, drive a stone. Accordingly, says Dr M., the oldest name for a stone was LAG, cloven, split, from its being a split of a rock. The word *rock* itself means a rift, a sliced or riven object. Roll a stone, RAG LAG, that is, run it. SWAG LAG, move a stone, a heavy stone by rolling. Fifthly, The names of objects would be varied according to the degree of the quality or action observable in them. Thus WAG was moving, GAG was going, RAG was running, BAG was beating, LAG was laying or licking, RAG was wounding or cutting, DAG was striking violently, and MAG was murder." Sixthly, The broad sound of the appropriate syllable might be changed for a slender one, to denote that the action was done in a diminished manner, or with less force, as the quick pronunciation suggested by the diminutive character of the act or object abbreviates the vowel; thus, LIG, a slight blow, and TIG, a slight quick touch, diminutives of LAG and TAG. Seventhly, In order to restrict and qualify the meaning of the original monosyllables, so as to make them answer various purposes, such as the circumstances of time, degree, and manner, new syllables were added. These were generally A, BA, FA or PA, GA or CA, DA or TA, LA, MA, NA, RA, SA; or, in a reverse form, AB, AF, or AP, &c.; and these, again, might be considered substantial terms, or roots, to which other syllables might be added. Thus, the original sense of WAG, to move or shake, would be modified by GA, go, or DA, do; as WAG-IDA, a contraction for WAG-DAG, signifying that the action is finished, and GAWAGIDA, that it is done and gone, both being actually the origin of the imperfectly preterite and perfectly preterite tense and participle in all the Teutonic dialects, which Dr M. holds to approach nearest of all tongues to the primitive language. Thus, again, if the radical was used as a noun, the syllables MA and NA gave it an attributive sense; as WAG, a wave, i. e. *moving* water, WAG-ANA, signifying *wave-made*, that is, become a wave, as *wave-augmenter*, or, in other words, *with or to a wave*, the wave added to some other thing, the original dative case. So BAG, to push or beat, becomes, with MA, which signifies to make, form, or work into a state, BAGAMA, BAGMA, or BAGM, the making of the *act*, *effect*, or *quality* of beating,—a very common form of adjective and substantive. And such additions might be to a great amount, so as, even after contractions have been made for the sake of convenience and dispatch, to constitute words of many syllables, and, consequently, great length. Of this we have an example in *moderation*, which is, in all its parts, MAG-DA-RA-TI-GA-NA-GA, formed in this succession: "MAG, *seize, comprehend, include, contain, measure*; MOGDA, *measured*, the preterite participle by DA, *done*; whence MOD and SA; MODUS, *measure, bound*, and SA, *agency*, which is implied in all ancient nouns. Add RA, *work*, to MOD, there results MODERA, *was making to have bound, keeping in bounds*; whence MODERATA, a preterite participle, *kept in bounds*. Add IG, *make*, to MODERA, and you have MODERATIG, an adjective, which means *making kept in bounds*, or *having the quality of being kept in bounds*. To MODERATIG join ANGA, or ONGA, a compound of NA, *make*, and GA, *go*, which is the origin of our ING in present participles, and MODERATI-GONGA is obtained, an abstract noun quite analogous to the Teutonic."

By means of these nine radicals and their compounds, it would seem, therefore, all kinds of ideas could be expressed; and thus we have discovered the elements, not only of all the European languages, but also of most of the languages of Asia that are connected with them. Indeed, on the well-known principle of the numerous variations of combination in the case of the seven musical notes, and in other cases, it is easy to perceive how effective such a number of terms would become. "In English, in Latin, Greek, Celtic, and Sanscrit, in ancient or in modern language, the same changes on the same words have produced that boundless variety which overwhelms the memory, makes the mind of man, in different ages and climates, a stranger to the mind of his own species, and creates no ordinary impediment to the dissemination of science." And as to the mode in which such combinations have been effected, it is laid down as a rule to be depended on, "that all the changes in the language of Europe, or, what is the same thing, in its dialects, have been subject to certain laws, not of an anomalous, arbitrary, or irregular nature, but such as have arisen from the mind of tribes and nations, exerting its powers on the mass of hereditary speech, that the purposes of communication might be obtained or promoted." Instances and illustrations of this truth may be found in the following results of the modifications and combinations of radicals and compounds: The series of derivatives from WAG, *move*, by the addition of the nine consignificatives, is WAG, WAC, WAB, WAF, WAP; WAD, WATH, WAT; WAL, WAM, WAN, WAR, WAT; and yet all of these compounds preserved the peculiar shade of meaning of their respective consignificatives. Each word in the series thus formed became liable to receive new additions from the nine consignificatives. But harsh and unnecessary compounds were naturally avoided, and examples are often to be met with of compounds which denote particular senses, to the exclusion of all the other senses. Again, the derivatives of the radicals and their compounds, formed with DA, *done*, are so innumerable, that by much the greater part of all the languages of Europe, and those of Asia which are allied to them, are made up therefrom. The words in which AD, AT, ATH, or DH, occur, except when these are initial, have been or actually are preterite participles; and from this source sprang many hundreds of those nouns and verbs which have long been deemed the most simple and original,—as, for example, our own words, *at, bat, dad, side, get*, which were all originally preterite participles, and were pronounced, AGT, BAGT, DAGDA, SIGA, GAGT,—as also, *strength, health*, and *worth*, originally STRENG-DA, HEAL-DA, WORDA. "This the whole. or one thing for another, might lead to the more contracted method of alphabetic letters,"—a conjecture which he conceives to derive support from the fact of the letters of certain ancient alphabets appearing as if they had been taken from hieroglyphic signs. He instances some of the Egyptian letters which still remain, and the resemblance between them and the hieroglyphic figures found upon the obelisks and other monuments of antiquity. This is a point about which, we conceive, there can be no doubt since the confirmation it has recently received from the inquiries into the literature of ancient Egypt, the vulgar character of which probably had its origin in the picture-writing of earlier times, as the resemblance becomes more and more distant, in proportion to the remoteness of the period of the writings from the age of the hieroglyphical archetype. "In some rolls of Papyrus," says Sir William Hamilton, (*Ægyptiaca*, Appendix, Note A.) "almost every letter bears a faint resemblance to some visible object, as an eye, bird, serpent, knife, &c., whereas in others it is very difficult to trace it."

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8. "To strike with a strong, rude, sharp, penetrating power," was RAG or HRAG; and

9. Swag was, "to move with a weighty, strong impulse."

These NINE WORDS, which are verbs of an interjectional nature, are supposed the foundations of all the conventional languages known to have existed in Europe; and how extensively and usefully they might be modified it is easy to shew, it being recollected that the circumstances of the action would be communicated by gesture, and the tenor of the voice. First, they might be repeated: Thus AG! AG! AG! would denote the action violent and terrible: AG, AG, AG, AG, that it was done frequently, or in a great degree. Secondly, they might be used in all the extent of the imperative mood; as Dwag, Dwag, drive, drive; NAG, knock, crush; MAG, MAG, kill him, "murder him by bruising." Thirdly, as each quality of an external object would be considered an agent, the character of its actions would suggest the appropriate monosyllable; and thus nouns and adjectives, as well as verbs, relative to that quality, would be formed at the pleasure of the speaker, as the act, the actions, and the effect of the action, must all be denoted by the same word. Hence AG would signify not only the action of fire, but also fire itself, and its bright or penetrating quality; as water, when yielding to slight pressure, was WAG, and, when it rushed in a stream, RAG. Fourthly, these monosyllables might be compounded, or put together, in a great variety of ways. Thus BAG, WAG, bring water; DWAG LAG, drive a stone. Accordingly, says Dr M., the oldest name for a stone was LAG, cloven, split, from its being a split of a rock. The word *rock* itself means a rift, a sliced or riven object. Roll a stone, RAG LAG, that is, run it. SWAG LAG, move a stone, a heavy stone by rolling. Fifthly, The names of objects would be varied according to the degree of the quality or action observable in them. Thus WAG was moving, GAG was going, RAG was running, BAG was beating, LAG was laying or licking, RAG was wounding or cutting, DAG was striking violently, and MAG was murder." Sixthly, The broad sound of the appropriate syllable might be changed for a slender one, to denote that the action was done in a diminished manner, or with less force, as the quick pronunciation suggested by the diminutive character of the act or object abbreviates the vowel; thus, LIG, a slight blow, and TIG, a slight quick touch, diminutives of LAG and TAG. Seventhly, In order to restrict and qualify the meaning of the original monosyllables, so as to make them answer various purposes, such as the circumstances of time, degree, and manner, new syllables were added. These were generally A, BA, FA or PA, GA or CA, DA or TA, LA, MA, NA, RA, SA; or, in a reverse form, AB, AF, or AP, &c.; and these, again, might be considered substantial terms, or roots, to which other syllables might be added. Thus, the original sense of WAG, to move or shake, would be modified by GA, go, or DA, do; as WAG-IDA, a contraction for WAG-DAG, signifying that the action is finished, and GAWAGIDA, that it is done and gone, both being actually the origin of the imperfectly preterite and perfectly preterite tense and participle in all the Teutonic dialects, which Dr M. holds to approach nearest of all tongues to the primitive language. Thus, again, if the radical was used as a noun, the syllables MA and NA gave it an attributive sense; as WAG, a wave, i. e. *moving* water, WAG-ANA, signifying *wave-made*, that is, become a wave, as *wave-augmenter*, or, in other words, *with or to a wave*, the wave added to some other thing, the original dative case. So BAG, to push or beat, becomes, with MA, which signifies to make, form, or work into a state, BAGAMA, BAGMA, or BAGM, the making of the *act*, *effect*, or *quality* of beating,—a very common form of adjective and substantive. And such additions might be to a great amount, so as, even after contractions have been made for the sake of convenience and dispatch, to constitute words of many syllables, and, consequently, great length. Of this we have an example in *moderation*, which is, in all its parts, MAG-DA-RA-TI-GA-NA-GA, formed in this succession: "MAG, *seize, comprehend, include, contain, measure*; MOGDA, *measured*, the preterite participle by DA, *done*; whence MOD and SA; MODUS, *measure, bound*, and SA, *agency*, which is implied in all ancient nouns. Add RA, *work*, to MOD, there results MODERA, *was making to have bound, keeping in bounds*; whence MODERATA, a preterite participle, *kept in bounds*. Add IG, *make*, to MODERA, and you have MODERATIG, an adjective, which means *making kept in bounds*, or *having the quality of being kept in bounds*. To MODERATIG join ANGA, or ONGA, a compound of NA, *make*, and GA, *go*, which is the origin of our ING in present participles, and MODERATI-GONGA is obtained, an abstract noun quite analogous to the Teutonic."

By means of these nine radicals and their compounds, it would seem, therefore, all kinds of ideas could be expressed; and thus we have discovered the elements, not only of all the European languages, but also of most of the languages of Asia that are connected with them. Indeed, on the well-known principle of the numerous variations of combination in the case of the seven musical notes, and in other cases, it is easy to perceive how effective such a number of terms would become. "In English, in Latin, Greek, Celtic, and Sanscrit, in ancient or in modern language, the same changes on the same words have produced that boundless variety which overwhelms the memory, makes the mind of man, in different ages and climates, a stranger to the mind of his own species, and creates no ordinary impediment to the dissemination of science." And as to the mode in which such combinations have been effected, it is laid down as a rule to be depended on, "that all the changes in the language of Europe, or, what is the same thing, in its dialects, have been subject to certain laws, not of an anomalous, arbitrary, or irregular nature, but such as have arisen from the mind of tribes and nations, exerting its powers on the mass of hereditary speech, that the purposes of communication might be obtained or promoted." Instances and illustrations of this truth may be found in the following results of the modifications and combinations of radicals and compounds: The series of derivatives from WAG, *move*, by the addition of the nine consignificatives, is WAG, WAC, WAB, WAF, WAP; WAD, WATH, WAT; WAL, WAM, WAN, WAR, WAT; and yet all of these compounds preserved the peculiar shade of meaning of their respective consignificatives. Each word in the series thus formed became liable to receive new additions from the nine consignificatives. But harsh and unnecessary compounds were naturally avoided, and examples are often to be met with of compounds which denote particular senses, to the exclusion of all the other senses. Again, the derivatives of the radicals and their compounds, formed with DA, *done*, are so innumerable, that by much the greater part of all the languages of Europe, and those of Asia which are allied to them, are made up therefrom. The words in which AD, AT, ATH, or DH, occur, except when these are initial, have been or actually are preterite participles; and from this source sprang many hundreds of those nouns and verbs which have long been deemed the most simple and original,—as, for example, our own words, *at*, *bat*, *dad*, *side*, *get*, which were all originally preterite participles, and were pronounced, AGT, BAGT, DAG-DA, SIGA, GAGT,—as also, *strength*, *health*, and *worth*, originally STRENG-DA, HEAL-DA, WORDA. "This rule is infallibly true in Teutonic, Celtic, Cymraig, Latin, Greek, Persic, Sanscrit, and Slavonic, throughout their varieties. The only exception to it occurs in the case of words in these languages, derived from the present participle in ND or NT, or NTH, which are varieties of NA and DA, combined to express actual, present, or rather proceeding action, not completed, but advancing into that state." The compounds of MA and NA constitute the next largest orders of words. Thus, all the words, with only two or three exceptions, from whatever European language derived, which are to be met with in Walker's Rhyming Dictionary, terminating in N, were once preterite participles, in the model of given, driven, striven: or adjectives formed participially. All European and Indian words in *M* are of a similar character; and the Latin, Greek, Celtic, and Sanscrit ordinary adjectives in ANUS, INUS, ONUS, those in AN, ON, IN, or ANA, INA, and the like, as well as all their nouns, adjectives, and verbs in M, belong to the same classes. The compounds of BA, which properly signifies *to agitate by a smart blow*, are numerous in Celtic, Greek, Latin, Slavic, and Sanscrit, as well as in the dialects of ancient Germany. There are examples in the Latin, as AB, APO, AB, which denote *touching in front*, or *elsewhere*; SUB, *under*, URBS, a *city*, from HWERB, *make a circle*, which the ancients did with a plough; UMBO, a *circle;* in the Greek, TOPOS, a *spot:* CUFOS, *bent;* and in the Teutonic, BAB, *shake;* WEB, *weaver*. Equally numerous with the derivatives of BA, are those of LA, *hold*, or *have*. We have instances of its combination with radicals in the series, ALA, BALA, CWALA, DWALA, FALA, PALA, GALA, HALA, LALA, MALA, NALA, RALA, SALA, which have many meanings, as will easily be seen from the various senses of the radicals. These examples may suffice. We proceed to disclose the formation or origin of pronouns, the moods and tenses of verbs, the cases of nouns, and other parts of speech. Compounds, formed from the union of the radical words and the additions, might be verbs, nouns, or adjectives. Generally speaking, if they were the first, the new word was a diminutive of the radical; if the second, it was a diminutive of the original noun; and if the last, it signified possessing the qualities of the primitive noun or verb. They were not contracted at first, nor until their length and harshness suggested the advantage of a practice which, however convenient, could scarcely fail to endanger the loss of the original meaning of the words. Pronouns were introduced about the time in which monosyllables gave way to words in the composite form, and probably preceded proper names. They signified possession; and, though originally common to whatever might be called *self*, were subsequently restricted, in modified forms, to what are now called the first, second, or third persons. In the instance of the languages of which Dr M. particularly treats, the words which underwent this change were AG, WAG, and HWAG, move with the hand, hold; THWAG, seize, take; SWAG, sway, manage with the hand, keep; and they became appropriated thus; AG and WAG, compounded with MA and NA, as AGAMA, signifying belong to possession, that is, to self, and AGANA signifying also belonging to self, or *own*, to the first person THWAG signifying same, thou, he, to the second: SWAG, by similar composition, SWAGMA, or SAMA, the same, and in its simple forms, SWA, and SA, to the third, and sometimes used as a demonstrative and relative pronoun, as AG and HWAG were as relative adjectives.

The verb and noun were originally indeclinable, but underwent various transmutations when composition was practised. Each noun now made bore the termination of its component, as A or AG, BA, GA, DA, LA, MA, NA, RA, SA, all of which experienced considerable changes from omission, union, and substitution. The nominative, or noun itself, then, varied according to the component word or words which happened to be in its termination, and all the other cases were adjectives raised on it, or springing from it as a radical, as, for example, the *genitive*, by adding AGA, having, or NASA, a compound of the seventh and ninth consignificative verbs; and the *dative*, by adding MA, in the sense of augmented or joined to the noun. In short, all the cases, terminations, and signs of number or gender, arose from the use of the consignificative verbs, which were perpetually applied, in the second stage of language, to multiply particular terms, to express the relations which naturally or artificially exist between and among objects, and to mark degrees of more or less in qualities and actions. As to the origin of gender, it is enough to remark, that as the unaugmented radical was either noun or verb, at the pleasure of the speaker, and, as being expressive of action alone, had no appropriating sign whatever, nouns of a limited nature were formed, by adding AG or A, *having*, RA, *working*, LA, *holding*, to the root; and as the agent, which *has*, *works*, or *holds*, is commonly a person, it was found convenient that the nouns so compounded, when they were appropriated to persons, should have their sex distinguished. The noun, in its simplest form, marked the object or action, without regard to the actor; and in this state was *neuter*, which all substantives and adjectives remained, till, by the consignificative words allotted to the masculine or feminine agent being added, they assumed a corresponding gender. All substantives, originally, were by nature adjective nouns, or expressed names of qualities; and the adjective, when applied to any substantive, was equally liable to receive changes of case, number, and gender. " For as both words owed their form to consignificative verbs, which were fixed to their radicals, for a special purpose, it was esteemed necessary that they both should have similar terminations in an uniform and perspicuous manner."

During the changes thus effected on the noun, the verb, " the fountain of language," was acquiring new and important properties. Monosyllabic at first, it expressed merely action, and was general in its sense, being a rapid articulation or ejaculation used to communicate or intimate the presence of some remarkable impression on the mind of the speaker. It did not express an individual event, but a class of action, and, properly speaking, was an affirmative verb in the present tense. In order to denote preterite time, the verb was repeated, according to a practice of which there are remains in all the languages "from Britain to China." The next step was to contract this compound, as LAG-LAG, *struck*, into LELOG; BAG-BAG, *beaten*, into BAEOG; "it being established as a general rule, by observation, that if A be the vowel of the present tense, or radical, the preterite receives O; but if the vowel be slender, the preterite receives A." This new form of the verb was completely preterite in sense, and, whether used as a participle, a noun, or with pronouns, in a particular tense, constantly retained its characteristic qualities. The imperfectly preterite tense derived its power, as already shown, from the addition of the consignificatives DA *do*, and GA *go*. With respect to another tense, it is remarked, "our fathers, from the beginning of their language, down almost to our own age, made no other distinction between a future and present in speech than that which may be gathered from the tenor of the discourse;" and that the Celts and Cymri followed the same practice. The verb was rendered personal by the addition of AG, I, THWA, *thou, he*, or *she*, to its several tenses; and it is almost obvious that our terminations *est, eth*, and *s*, are the remains of the pronouns formerly joined to the verb itself, and by which our language was placed on a level with its sister dialects, the Greek, Latin, and Sanscrit. They are in reality the pronouns shortened; but when it was found difficult to pronounce them, they were frequently dropt. The exact sense of them was not always known; "in the plural they were grossly corrupted, and, in the end, like many other original properties of the old language, utterly removed, and their place supplied by the use of the separate pronouns, which formerly had not been named, except in cases of special emphasis." Thus LAGA, LAGAST, LAGATH, LAGAM, LAGIATH, and LAGANDA, were changed, in several stages of corruption, into I *lay, thou layest, he lays, we lay, you lay, they lay*. The six pronouns, A, IS, ITH, AM, EITH, ANDA, appear distinctly in the verbs of the Visigothic, the true example for all the Teutonic dialects; but in the *Anglo-Saxon* and German, all the plural terminations have been corrupted into ON and EN, in consequence of the resemblance of AM and AND.

The primitive languages had no subjunctive, optative, or conditional tenses, any more than a future distinct from the present; the specification of the difference between an action actually performed and about to be performed, or performed on any particular condition, being accomplished by laying a more full emphasis than usual on the latter syllables of the verb, the effects of which are visible in the persons of the subjunctive in the Teutonic, Latin, Greek, Sanscrit, and Persic verbs. The result was, in course of time, the change of the last vowels from short to long; the voice, in laying on the greater emphasis, protracting them, and this is "the natural sustained mark of the mind in suspense, or under desire." The *rationale* of this principle is apparent to an English reader in the circumstance of the personal terminations *est, eth*, and *s*, being, as is correctly understood, to be omitted or suppressed when such words as *if, through, unless, except, whether, or*, are used before verbs. As to the passive voice, it is to be observed that all verbs were naturally active, and had no provision for the designation of a passive state,—those of such a kind as *I bear, I suffer, I stand*, and every other pertaining to a fixed, passive, or inanimate condition, being active in form, and, to a certain degree, in idea, and having their origin in verbs which signified the contrary. Besides the neuter sense of these verbs, a new voice was invented in every verb, namely, the middle, reciprocal, proper, as it has been variously called. This really described the action of the verb as being performed on the actor, but was transferred, in Greece, India, and Germany, to the passive, by the junction of a word, denoting *self*, sometimes contracted or corrupted with the persons of the active tenses, so that one and the same natural sense produced *apparently opposite* meanings. One great leading principle, on which all new tenses or forms of the verb were constructed, was the conversion of the verb into a noun, to which were added such consignificative words as expressed the idea of the mind, whether relative to time, to incipient, frequent, or diminished action, or any other circumstances affecting the word. Thus, LAG, lag, with LA, which means *working, possessing, holding*, makes LAGSA, literally, *lag-working, having*, or *partaking of working*, but, in use, to *give-laying, to lay, to begin to lay, to be about to lay, to increase in laying*. Accordingly, this is the source of many *inceptive, desiderative*, and *frequentative* verbs; of the *first future* in the Greek, and the *second future* in the Sanscrit. The origin of the four *participles*, from which so many derivative verbs and nouns are formed in every dialect, is, the completely preterite in the reduplication of the verb,—BEBOGA, *forced*, bent; LELOGA, *laid*; the common or indefinitely preterite in the prefixing of GA, *go*, or adding DA, *do*, as BAGIDA, *driven by striking*, LAGIDA, *laid, licked, seized, beaten*; the preterite participle in ANA, INA, ENA, or ONA, formed by affixing NA, work upon, effect, *operate*, as is still observable in the English words giv-*en*, driv-*en*, drunk-*en*, and, as in the old language, BAGENA, *bank, banged, bent, impelled*, LAGANA, *licked, laid, put down, levelled, lessened*; and the participle of the present tense, in the combination of the verb and two consignificatives, NA, work, and DA, *do, make*, or, in some dialects, GA, *go*, as LAGNADA, or LAGANDA, performing the act of *laying*, LAGANDA, *going through with the act of laying*. These important modifications of the verb occurred in the Visigothic, Latin, Greek, Sanscrit, Celtic, and other dialects, and differed merely in slight shades of pronunciation, as observed, in some degree, by the consignificatives LA, *he*, A and I, *she*, ON, and UN, which were special marks of the masculine, feminine, and neuter genders. Farther, the participles of the reduplicated verb became obsolete in many dialects, or were superseded by those in DA, though there are numerous examples of adjective and substantive nouns being formed from such obsolete varieties. This leads us to notice the foundation of derivative nouns, both adjective and substantive. They arose, 1. from the preterite participle in *ed*, as *cleave*, cleaved, *join, joined*, on which we may easily found an adjective and a substantive. The former of these is manifest in *cleaved wood, joined pieces*, the meaning of which is that the actions of cleaving and joining had been done or performed on the objects; and the latter in the change of *cleaved* into *cleft* and *clift*, and *joined* into *joint*. It follows from this, that all verbs, adjectives, substantives, and other words not a person of a verb, which end in D, TH, T, or in any of those letters, with a single vowel after it closing the word, are directly or indirectly descended from the preterite participle in DA, as the present participle in NADA or NDA; and that substantives in all languages are easily converted into verbs, and combined with the preterites consignificative, as in *fated*, *vaulted*, *footed*. 2. Both substantives and adjectives were produced from the preterite participle in EN. Thus, from the participles of the word *heave*, to lift, in old English made *heaved*, and *heaven*, and *hove*, we have the three original substantives, *heaved*, the head; *heaven*, the elevated part of the atmosphere; and *hove*, any thing raised, a house, in many dialects called *hoff*. Again, such adjectives as *riven*, *driven*, *chosen*, are of this class, besides many substantives, attributives, and verbs, such as *even*, *waxen*, *wheaten*, *hasten*, *glisten*, the word which gives them their peculiar sense, being NA *make*, *work*. 3. The most original of all derivative words proceeded from the ancient redoubled preterite; thus, from CLIF, *cleave*, CLIF-CLIF, or CECLOF, *clove*; drink, DE DRONK, *drunk*; and sometimes, such preterite participles, besides a change in voices, received ED and EN, of which we have examples in *hoven*, *frozen*. 4. The participle of the present in ANDA and ANGA was very productive of new names and verbs, in a regular or a contracted form; there are examples of substantives in *lightening*, *evening*, *writing*,—and of verbals in *thinking*, *loving*.

Enough has been said to point out the proper mode of investigating this curious subject of the composition, contraction, substitution, and derivation of words, constituting verbs, adjectives, and substantives, in all their varieties. The reader who wishes to prosecute it will, of course, betake himself to the work which we have professedly followed, where, notwithstanding several heavy imperfections, it is pursued with great ingenuity, learning, and success. We have still some observations to make on a class of words, whose claim on our attention have of late years, and chiefly through the sagacity of Mr Horne Tooke, been triumphantly established. We mean what are called the indeclinable parts of speech, such as *adverbs*, *prepositions*, and *conjunctions*.

It was the discovery of that singular man, that there are no words in language destitute of meaning, or which possess no other signification than what they derive from others. By applying to language the principles of inductive philosophy, he succeeded in demonstrating the origin of these degraded portions of speech, and in developing the reality and the variety of their significancy. But, however important his labours, considered in relation merely to philosophy, the determination of the respective and connected values of different words, they would have been of immensely greater value, had he followed the light which beamed upon him, regardless of the metaphysical subtleties and hypotheses of his day, and contented himself with an exposition of the means by which language, considered as an instrument for the communication of thought, arrived at its present efficiency.

This is one of the particulars in which the great merit of Dr Murray, who seems to have most candidly and judiciously appreciated his predecessor, consists; and here, accordingly, we cannot help quoting the luminous paragraph in which, modestly and by implication comparing their respective researches, he lays down the principles by which he himself had been guided throughout. "I trust that the view of the human mind, exhibiting its various powers in the formation of language, will vindicate the claims of our species to *an immemorial use of all the faculties which it now enjoys*, and to a rank, at all times, far above the imaginary being that is supposed to have vegetated into common sense. Abstract ideas of the common kind would be the property of every human breast, though it had never approached another, but had braved from its infancy the forlorn dangers of the wilderness. Many of those feelings and habits that are developed by social intercourse, it could not possess; the impression made on the senses by external nature, and the simple ideas that rise from these would often call forth a share of particular consideration, be abstracted one from another, and form materials of ordinary thought." But it is to be regretted that even Dr Murray was not able altogether to extricate himself from the tramels of a system, which, we do not scruple to say has done more to embarrass inquiry, and impede discovery, on this as well as some other subjects, than even the Aristotelian logic in respect to reasoning and philosophy. The reader will probably remember, that Dr Murray, in speaking of the foundation of language in human nature, confined himself to the exercise of "perception, memory, abstraction, and judgment," reckoned by him, according to the system of his day, the natural faculties of the mind. For the evidence of the existence of such general faculties, he seems never once to have inquired. He does not appear to have been aware of the very different views of the composition of human nature entertained by the late Dr Thomas Brown, who considered the powers thus denominated merely *states* or *conditions* of mind, and not distinct faculties; still less did he approach to any acquaintance with the philosophy of Gall and Spurzheim, who, in place of regarding them as either faculties or states of mind, directed their attention to the discovery, the enumeration, and the illustration of a great number of specific propensities, sentiments, and powers, which, though known and observed to exist, and, by their combination in various proportions and degrees, to constitute the diversities of moral and intellectual character met with among mankind, have not been taken into account by modern metaphysicians. The exposition of their principles must be given elsewhere; and it is enough simply to have alluded to them here, for the purpose of maintaining the impossibility of ever doing entire justice to the history of language, without previously ascertaining, or endeavouring to ascertain, the amount and influence of those primitive sources of thought and feeling from which all its peculiarities, whether national or personal, have issued.

The chief office of words placed adverbially, before adjective nouns, verbs, and several other parts of speech, it is well known, is to mark the manner in which a thing exists, or acts; and, in this view, they are connected with an ancient use of the cases of nouns. Thus, some adverbs arose out of the genitive, as *else* from ELLES, *once* from ONES and ANIS, *thus* from THEOS, and *towards* from TO-WEARDES: The next class originated in the dative, which, from its signification, was more suitable than the genitive, inasmuch as all adverbs are capable of being translated in a short paraphrase, the first words of which are *from, with, to, at,* or *in*: as for "he ever lives," we may say "he lives at all times," for "he fights gallantly," "he fights in a gallant way, or with bravery," for "he rises early," "he rises soon in the morning;" and, accordingly, nouns or adjectives which expressed the cause or manner were put in the dative case, in every dialect where that case occurred: From the accusative arose such adverbs as required the sense of *on, at, upon,* to form them, of which we have examples in *then,* originally THAN, THANE, and *when,* originally HWAN, HWANNE, as THA signified *the,* or *that,* and THWA, *which,* and their accusatives being employed to express *at,* or *on that* (time,) *then,* and *at,* or *on which* (time,) *when*: fourthly, some adverbs were formed by the addition of the consignificatives DA, NA, and RA, formerly explained, as from THA, *that* or *the,* THAD, *of,* or *belonging to that place*; from AF, *separated,* AFT for AFODA, *offed, in,* or *pertaining to the place which is off,* or *the time which is gone*; and from FAIRRA OF FARA, from FAR *to go,* came FAIRRATH, or FAIRRAD, *made far or belonging to far*; and from this class, forming a new order of adjectives, came, with the addition of RA, *make,* such words as THADERA, HWADERA, now *thither, whether*; as from another class with NA, proceeded HINDANA, UT-ANA, &c. signifying, *in the states of behind, out,* &c.: and, lastly, some adverbs came from the use of the present participle, or one of its terminations; as CALLUNGA, *entirely,* or *by all means,* DEARNUNGA, *dernely,* or, *in a secret manner,* UNCEAPUNGA, *in an unbought manner*; and, again, many adverbs were formed from adjectives, by the addition of LIC, *like,* as SIDE-LIC, STOLEN-LIC, HIDE-LIC, signifying *lateral, surreptitious,* and *secret,* from which came SIDE-LIC-ING, STOLEN-LIC-ING, HIDE-LIC-ING, by contraction, *sidling, stownling, hideling,* and, in the genitive, the adverbs *sidlins, stownlins, hidlins,* which are frequent in Scotland. In speaking of some of the words thus derived, Dr Murray says, "The use of these words is as common in India as in England. All the dialects possess them. They are found on the Celtic mountains, in Russia, and in the whole extent of Europe, from the polar regions to the borders of Africa. The purity of the German dialects never triumphed more victoriously over that of all the other European tongues, than in the explanation of these words, of which the history had been completely lost; and on the derivation of which, the ablest classical scholars have written many absurdities." A similar account is to be given of conjunctions and prepositions; and it evidently appears that such words have as certain and essential meanings as either verbs or nouns.

It is not easy to account for the differences observable among various nations, apparently in a similar state of civilization, that is, nearly in like barbarism, as to the practice of numbering, and the application of words to its elements. The French academicians discovered people in South America whose arithmetic did not exceed the number of three, while those tribes which colonized Europe seem, before separating from the parent stock, to have had the names of numbers nearly in the same state in which they were afterwards introduced into Germany. It would be curious to know whether the former had any peculiarity of organization in that portion of the head to which the followers of Dr Gall refer the faculty of number. But, in the absence of such information, one can only speculate as to the cause of the deficiency. Dr Murray rather questions the correctness of the opinion frequently entertained as to the limited exercise of abstraction among savages. He finds some difficulty in accounting for the names of the numbers above one, while the name for one itself he ascribes to a word indicating collection, junction, or compactness; but is inclined to think that they may be deduced from the practice adopted by our remote ancestors of knotting a cord, or knotching a table. "The names, (says he,) certainly allude to a practice of this nature; and the adoption of ten, at a considerable distance from unity for the periodical number, intimates, that they had a considerable share of divisions before them." This may have been suggested by the number of the fingers; but Dr Murray is not clear that philology lends any confirmation to the notion of the similarity between *ten* and *toes,* which has been advanced as an argument. Several of the names of numbers and their derivations are considered by him doubtful and obscure. He gives the following enumeration as probable:

1. EAC, EK, EACEN, AIN, and AN, *one,* from EAC, *to continue, add, join.*

2. TWEG and TWAG, *twa, two,* from TWAG, *to divide by force, cut.*

3. THRIG, THRINS, *three;* from THRIG, *to throng, press together.*

4. FEDWAR, *four;* the conjunction from FAGD, a junction. This is a noun formed by adding the consignificative RA to FED.

5. FIMB, or FIMF, *five;* belonging to the conjunction, that is, to four.

6. SEACS or SAIHS, *six,* from SEC, *to cut*; the notch or division.

7. SIBUN, *seven,* from SIB, related, viz. a-kin to the foregoing.

8. AHTO and AHTAU, *eight,* (evidently an abstract noun,) addition, from AC, or EAC, to augment.

9. NIGON, NIUN, *nine*; the near, nigh, last, next to ten, from NIG, *to be close, to press.*

10. TIGUND, or TAIHUND, *ten*; either the tying or the tokening, that is, the index number. It is a present participle from TIG, *to tie,* or TAEC, *to show, point out.*

The other numbers are duplications of these, and proceed thus: AN-LIBEN, one left when ten is counted; TWA-LIB, two left after ten; THRINS-TIGUND, three-ten; FEDWAR-TIGUND, four-ten; FINF-TIGUND, five-ten; SEACS-TIGUND, six-ten; SIBUN-TIGUND, seven-ten; AHTO-TIGUND, eight-ten; NIGON-TIGUND, nine-ten; TWIG-TIGUND, or TWINS-TIGUND, two tens; THRINS-TIGONDINS, or perhaps TIGONDA, three tens; FEDWAR-TIGUNDINS, four tens; FIMF TIGUNDINS, five tens: SEACS-TIGUNDINS, six tens, &c. &c. NIGON-TIGONDS, nine tens; TAIHUN-TEHUND, ten tens; commonly contracted into HUND. Similar composition produced the centenary numbers, which, in course of time, were abbreviated, as THRINS-HUNDA for THRINS-TAIHUN-TEHUNDA. The names of numbers afford an excellent mode of determining the affinities and descent of the European nations, and may, therefore, occupy much attention in other articles. At present it is sufficient to give the following table, illustrative of the demonstrative connection of several tribes, and therefore of the history of Europe. The inference is deducible from it, that the Teutonic nations alone preserved the numeral names in tolerable purity, as derived directly or indirectly from the inventors: "a proof, says Dr M. that these nations have descended from the primeval race in a direct line, that they have never been mixed with foreigners, and that, while the Celts, Greeks, and Hindus, have all deviated more or less from the original, the Teutonics have adhered to it with a pertinacity which could not have been maintained but at a distance from all intercourse with the south."

	1	2	3	4	5	6	7	8	9	10
Teutonic . .	An,	twa,	thrins,	fedwor,	fimf,	saihs,	sibun,	ahto,	nigun,	tigond,
Celtic	Aon,	da,	tri,	ceathar,	ciug or corg,	se,	seachd,	ochd,	naoi,	deich.
Latin	Unum,	duo,	tria,	quatuor,	quinque,	sex,	septem,	octo,	novem,	decem.
Greek . . .	Hen,	duo,	tria,	tessares,	pente,	hex,	hepta,	octo,	ennea,	deca.
Cymraig .	Un,	dau,	tri,	pedwar,	pump,	chwech,	saith,	wyth,	naw,	deg.
Slavonic . .	Odine,	dva,	tri,	cheteire,	pyate,	sheste,	sedme,	voseme,	devyate	desyate.
Persic	Yek,	du,	seh,	chechar,	punge,	shesh,	heft,	husht,	nuh,	deh.
Sanscrit . .	Eka,	dwi,	tri,	chetur,	punchan,	shash,	saptan,	ashtan,	navan,	dasan.

taihund, & tehund
tigons.

From these and similar specimens, together with the examinations of the several dialects, some important conclusions may be drawn,—as, that all these nations are from the same stock, but have also several special affinities: that the Persians and Indians were one people about the time of the Assyrian empire: that the Slavi or Sauromatae were northern Persians, who had crossed the Araxes, and dispossessed the Scythians: that the Celtic and Roman are nearly related, and still more so the Roman and Greek; and that, as formerly hinted, the Teutonic stands by itself, original, and less corrupted than any of the rest. It is farther inferred by Dr M. proceeding on such light as history affords, and the fact that the ancient British or Cymraig, which derives its general structure from the Celtic, approaches closely to the Teutonic in the names of numbers, and in various particular words, that the progress of emigration westward was in this order: "first, The Celtae, by the way of the Euxine, and along the Danube, into Gaul; next, the Cymri, in the rear of these, and originally part of them, though changed in respect of language by long separation. The Cymri must, from an evident resemblance in their speech to the Teutonic, have resided long in the vicinity of the Gothic race. At length the Cymri occupied Gaul and the adjacent countries; but they were soon followed by the Teutonic nations, whom they for a time resisted ably, and even invaded in the territories beyond the Danube. The Cymraig Gauls carried their arms along the Danube into Illyrium and Dalmatia; they took possession of the Alps, and colonized the whole north of Italy." The connexion of the Teutonic with the Sanscrit, and of the Sanscrit with the Persic, is put beyond all question by a careful comparison; it would not be difficult to shew also an affinity between the Slavonic and the Persic and Sanscrit, and, of course, to the Teutonic, especially to that early dialect of it, the Greek; and, in short, it can be made extremely probable, that all the dialects spoken from Zealand to the Adriatic, all the dialects of the Celtic, the Slavic, and modern India, are all related, as branches, to the same language. Succeeding labours may extend these connexions to other dialects, and eventually, it is possible, to the radix or basis of an apparently very different class of dialects, those of the Hebrew, Arabic, Chaldee, Syriac, and Abyssinian nations, which, however, we must still consider essentially distinct, and the peculiarities in the nature, properties, and progress of which are certainly far less known, and have been less philosophically examined. But, in place of attempting any inquiry into these, it will be more satisfactory to point out the course in which any theory of the kind ought to proceed, and the principles by which it ought to be guided. "I am convinced," says Dr M. "that the wildest and most irregular operations of change in every language obey an analogy, which, when it is discovered, explains the anomaly; and that, as is common in the study of all progressive knowledge, a view of the gradual history of human speech, in any considerable portion of the world, leads directly to a scientific acquaintance with its principles, which may be of the highest use in illustrating obsolete dialects, in preserving the purity of our own, in facilitating the intercourse of any one nation with all others, and in completing the moral topography of the globe."

There seem to be two methods in which the whole subject of language may be prosecuted, and they are similar to the analytical and the synthetic processes of the science of chemistry. The first consists in an examination of all the known languages, with a view to the resolution of them into the various elements of which they are composed, and the discovery of the relations which these elements bear to one another. For the beneficial employment of this analytical exercise, some rules and cautions may be laid down. In the first place, we must have ample materials before us, and these must be as authentic and genuine as can be procured; in other words, we must possess copious and correct specimens of various dialects, and must so far understand them as to be able to construe them and bring them into comparison. For this purpose, languages, or the dialects of languages, are to be sought for in established writings and true vocabularies; and, failing these, are to be cautiously and faithfully taken down from the utterance of the best informed of those nations who use them. These specimens are valuable in proportion to their antiquity, their connexion, their purity, and their number. 2dly, The precise, original, and wonted meanings of words, such as they are found, must be carefully ascertained, first, in the dialect in which they occur; next, in the nearest cognate dialects; and, thirdly, in those dialects of the same language which are more remotely allied. In this process the authority of the dialects may be considered to be in the joint proportion of their antiquity and their purity; and, should dialects fail us, we must seek for the sense in the context. 3dly, The changes that have been made in the sound, the form, and the meaning of words must be investigated, according to what is known of the nature of the organs of speech, the peculiarities of individual people, and such circumstances in their history, geographical position, and international relations as are on record. Here a variety of information is required, the result of extensive research; and certain intellectual habits, arising from the study and application of the general principles of grammar, in its widest and most philosophical signification, are essential. 4thly, In determining the etymologies, and, of consequence, the history and relations of words, we must respect those special laws of the dialects in which they are presented, that relate to articulation, composition, substitution, derivation, and omission; and, failing acquaintance with these laws, from unavoidable causes, we must be guided by those of the parent language, if known, or other appreciated descendants. But, in thus proceeding, we must recollect, that all inferences from general rules have no other authority than probable theories, unless they can be substantiated by positive facts; and it is obvious, that, in deducing them, there is need for much caution, modesty, and judgment. Generally, then, all theories, either as to the meaning of words and their etymologies, or the affinities of dialects, which cannot be verified by facts, are to be distrusted, however ingenious or plausible; and theories are to be held of importance and authority only in the proportion of the facts by which they are supported. 5thly, No intermixture of dialects, not proved to be related, ought to be tolerated, save as merely illustrative of particular or common modes of thought and expression, to be accounted for on some general principles of human nature. 6thly, Certain results of the observations of former inquirers, or, in other words, certain discoveries already made, may be entitled to influence our labours, and of these may be safely and conveniently reckoned the following: No language is altogether irregular, uncertain, and capricious in its progress and changes. Some principles on which all the changes observable in languages are founded may be ascertained, and it will be found that the peculiar modes of composition, derivation, inflection, alter their appearance only, but are themselves retained through long intervals of time and place. Mankind generally feel and think in a similar way, on the various subjects that are presented to them or exercise their minds; and hence numerous coincidences and correspondences may be expected in languages not connected with each other, as well as in dialects of the same language, which differ in phraseology. Compounded languages have proceeded from long harsh combinations, the parts of which are self-explanatory, to softer forms, effected by means already enumerated. Languages, especially those of early times and rude people, being the property of communities and not of individuals, have rarely been modified, perhaps never fundamentally revolutionized, by personal caprice. "Language," says Dr M. "descends to rude tribes like their family features. It is hardly more an object of their attention than the air they breathe. They may indeed lose their native dialect, or intermix it with another; but, independent of the natural bias to retain it, and the trouble of gaining a new one, barbarians have a simplicity peculiar to their state, which preserves their language from those innovations and artificial terms so frequent in polished idioms. Some exceptions to this general remark must be made in the case of those tribes, which disfigure their speech by an affectation of guttural, nasal, and singular sounds. At the same time, the common prejudice against all shades of guttural or nasal pronunciation is not founded on an impartial inquiry into the elementary beauties of articulated speech." The mother tongues of Asia and Europe, those, namely, on which the Hebrew, Syriac, Chaldaic, Arabic, and some other dialects are founded, on the one hand, and the northern and western, already specified, on the other, sprang from radical words, framed in a rude manner, to express different kinds of action that affected the senses. The radicals of one of them have been mentioned. The history of those of the other is still obscure, but may be elucidated by future inquiries. All the original nouns of both came from verbs; all their original substantives were of an adjective nature, and expressed action or quality; and all their consignificative words were used separately in former times, however they may now be combined. It may be presumed, from these circumstances, that all other languages have been formed in a similar way.

If this concluding sentence be correct, and we are persuaded that it is so, we may be allowed to hold it imperative on the *scientific* philologist to pay more attention than has been hitherto given to the second, or what we have ventured to call the synthetic method of prosecuting the history of language, meaning thereby the investigation, in the first instance, of those principles in our constitution which identify our race, amid all their diversities of speech, and from which the powers of expression and interpretation arise. Many of them were alluded to in treating of natural language, which, as we endeavoured to shew, is the spontaneous result of the operation of such original powers, when excited by suitable objects. For others, we must refer to the article MIND, where it will be proved that there is in our nature a special faculty appointed for the acquisition and the employment of language, and that there is actually a certain portion of our bodily frame allotted for the organ on which it is dependent for its manifestation. Assuming this as a fact, then, the evidence of which, as it is not derived from abstract reasoning, but from positive observation, cannot be set aside by any *a priori* argument, we would merely suggest at present, that the influence and use of that special faculty would require to be investigated, not simply and in an insulated manner only, but in combination with all the other special faculties, sentiments, and propensities, which are capable any way of expressing themselves or indicating their existence and operation; and that, as these faculties, sentiments, and propensities, are not found in the same degree or proportion in all men, but, on the contrary, vary extremely, both among individuals and nations, so as to afford well-marked characteristics, the knowledge of them must greatly aid us in determining the origin, the differences, the alliances, and the qualities of language. It is one of the unquestionable, and, indeed, unquestioned peculiarities of phrenology, the advocates for which do not hesitate to claim for it the very highest distinction as a science or species of philosophy, that it asserts the direct relation and concomitance between even the conventional languages of nations and their characteristic, and ascertainable cerebral developements. There is surely nothing absurd in the idea; and undoubtedly the very definition of brain, given by Dr Johnson, whom no man ever yet thought of either charging with materialism or despising as a driveller and a quack, may be conceived to point out and to fortify the foundation on which the main doctrines of mind are erected.—" Brain," according to him, " is that collection of vessels and organs in the head, from which sense and motion arise." Is it unphilosophical, supposing this to be an accurate and sound definition, to endeavour to discover what are the vessels and organs which make up the collection so called,—how they are disposed and connected,—what are their precise functions,—whether or not they are alike in number and power in all men,—and whether any differences observable in them are conjoined with modifications of sense and motion? And, if not unphilosophical, who, on the authority of his own indolence, which precludes conviction, by virtually annihilating evidence, or on that of his metaphysical creed, which prejudices him against it, shall dare to deny the possibility of discovery, as the successful issue of so warrantable a mode of inquisition?

The common progress of arbitrary language may be narrated in few words. The mind, conscious of its own efforts, naturally and constitutionally believes that external objects are influenced by corresponding laws. Its first oral or articulated expressions denote either its own actions or those which are inferred. They were monosyllabic verbs, and described acts of different qualities. From these arose adjectives and substantives, both of which express qualities of objects. Combinations of the original words limited their signification to modes and times of action,—certain gestures, or other elements of natural language being used to render them more intelligible. The remaining parts of speech, as they are called, arose out of similar efforts, and were used to modify general significations. Compounds, as being more precise and descriptive, supplanted simple terms, which, accordingly, are much less frequent in established long used dialects. It is the idea of active power which gives the vivid interest observable in descriptive poetry and impassioned oratory; but, in course of time, language lost much of this character, and became a system of signs, which, to appearance, is arbitrary.

Poetry and oratory are greatly occupied in the invention and application of those figures of speech to which the idea of active power gives rise, and the peculiarities, number, and management of which constitute the diversities of *style*. This word, derived from *stilus*, the Latin name of the instrument used by the ancients in writing on their waxen tablets, accordingly denotes the manner of expression in speaking and writing, or the character of language in respect to truth or purity, perspicuity or distinctness, vivacity or intenseness, elegance or beauty, and impressiveness or influence. Of these qualities, the most important, and that which gives value and the highest agency to all the rest, is *truth*, which we shall consider in relation to the art of logic, that is, of thinking and reasoning.

If " to reason" be rightly defined by Dr Johnson, as we think it is, " to argue rationally," or " to deduce consequences justly from premises," then every act of perception, by any one of our faculties, which produces the belief of the existence of a corresponding cause, or makes us acquainted with the qualities of the agent, is an example of it. Hence philosophical logic must be founded on an analysis of the various faculties and active powers of our nature, considered in their simple states, their combinations and modes of operating, and must comprehend all the kinds of evidence of which physical, mathematical, moral, and divine truth can admit.

Terms, in the language of logic, denote words expressive of ideas, and are arbitrary signs, the meaning of which must be determined conventionally.—They are either *singular* or *universal*, as they are applied to, in the same sense, or predicated of, one individual or several individuals. The collection of individuals, to whom any term is applied, constitutes the *extension* of that term, and may be very various in amount. Singular terms have the least extension; but they are complex, or embrace a great number of component parts, which, therefore, together, constitute the *comprehension* of terms. It follows, that the comprehension determines the extension; or, in other words, that the increase of the number of the particulars which enter into the signification of a term, diminishes the number of the things to which it can be applied, as, on the other hand, diminishing the number of the component parts of the ideas denoted by terms increases the number of the individuals to which the terms may be applied. It follows, too, that when the comprehension of two terms is alike, their extension must be the same, or they are *synonymous*.

The objects in nature may be variously classified or arranged; and of every object something may be affirmed or declared. The distinctions, or classes, are styled *predicaments*, and the kinds of things affirmed of them are styled *predicables*. The scholastic logicians generally enumerated ten of the former and five of the latter; but the enumeration in both cases is dependent on a principle which, though seemingly essential, is in reality arbitrary. Other principles, and, consequently, other enumerations, have been and may be assumed.

It is certainly desirable that one system should be universally adopted; and, that it might be so, it would require to be natural and obvious: but hitherto the subject has been left almost entirely to the caprice of individuals. Phrenology, despised and ridiculed as it has been, promises this, and ere long, it is confidently believed, will accomplish what true philosophers in all ages have desired. Undoubtedly a good, perhaps the best possible system, might be founded on the discovery and general admission of the primitive faculties, sentiments, and propensities of man. For example, the senses, and the knowing faculties, each of which has its own specific object or quality of object, might indicate, and give names to all the predicaments, or, as they are also called, *categories*, which relate to matter and its properties; the propensities would afford predicaments regarding life and animal powers; and the sentiments those concerning mind, with all its affections and capabilities; while the predicables might be deduced exclusively from the reflecting powers. This idea is susceptible of sundry modifications, and may lead to important benefits. It results from a proposition which may be held as an axiom in philosophical logic; namely, every thing of which we think, or can in any way discourse, is made known to us by, or has a relation to, some one or other of our senses, our knowing faculties, our propensities and sentiments; and, on the other hand, all the logical assertions that may be made of it, as the *genus* or the *species* to which it belongs, its *essential difference*, any *property* it has, or any *accident* affecting it, have a reference to or are the conceptions of the reflecting faculties. The same thing might be said of the four predicables of Mr Locke, namely, *identity* and *diversity*, *relation*, *co-existence*, *real existence*. The seven predicables of Mr Hume, again, namely, *resemblance*, *identity*, *relations of space and time*, *relations of quantity and number*, *degrees of quality*, *contrariety*, *causation*, have not only a reference to, or are the conceptions of the reflecting faculties, but also partake of or are amenable to some of the knowing faculties.

Hitherto we have spoken of the perceptions or simple apprehensions of the powers of the mind. We come now to that exercise of it which is usually denominated *judgment*, and which consists in observing and comparing different perceptions together. The results of this exercise, when reduced to words, are denominated *propositions*, which may, therefore, be defined, "affirmations or negations of some terms about others." These are *simple* if not resolvable into several, and *compound* if otherwise. The term in them about which the assertion, whether affirmative or negative, is made, is called the *subject*; that in which the assertion is contained, the *predicate*; and the substantive verb, which appears, or is comprehended in the predicate, the *copula*, as the remainder of the predicate is the *res copulata*. The predicate and subject constitute *the terms of the proposition*. It is the assertion of the agreement or disagreement of the predicate with the subject, and not the actual agreement or disagreement, which determines the quality of a proposition to be affirmative or negative. All affirmative propositions have the same quality, and so have all negative propositions; but these two are contrary to each other. A negative proposition may be made affirmative, by connecting the negative, not with the *copula*, but with the *res copulata*, and *vice versa*. Propositions, in which the subject is a general term, and where the predicate is either affirmed or denied of the whole, are *universal* propositions; those in which the predicate is affirmed of a part, are *particular* propositions. All the former agree in quantity, so do all the latter; but, considered in relation to each other, differ in quantity. In every universal proposition, the subject is universal, that is, taken in its entire extension; in every particular proposition it is particular, or taken in part only of its extension. A proposition is *indefinite*, when neither universality nor particularity is annexed to the subject. The predicates of affirmative propositions are particular; those of negative are universal. The *matter* of propositions is called *necessary*, when the things to which they relate are so that they cannot be otherwise; and *contingent*, when they are so that they might be otherwise: again, it is said to be *impossible* when the things not only are not, but cannot be; and *possible*, when, though they are not, they might be. A proposition is *pure*, when it simply asserts that such things are or are not; and *moral*, when it asserts the manner in which they are or are not. In relation to quality and quantity taken together, propositions are of four kinds, 1. Universal affirmatives; 2. Universal negatives; 3. Particular affirmatives; and, 4. Particular negatives. These four kinds have long been designated by four vowels, according to this couplet:

> Asserit A, negat E; *sed universaliter ambae:*
> Asserit I, negat O; *sed particulariter ambo.*

The logical truth of propositions consists in the correspondence of the sentiment contained in them with the nature of things; as moral truth consists in the conformity of the sentiment conveyed to the sentiment entertained by a speaker or writer. If the judgment of the mind, as expressed, be conformable to the reality of things, logical and moral truth will coincide. The opposite to logical truth, is properly speaking, an *error*; that to moral truth is a *lie*. The judgment of the mind may not be agreeable to the nature or reality of things expressed in a proposition. In this case a *lie* is told, while logical truth is delivered. In the opposite case, an *error* may be committed in telling truth.

Simple propositions may be compared together, or have certain *relative affections*. The first of these, *subalternation*, signifies the deduction of a particular or singular proposition from a universal, the subject and the predicate being the same. The universal proposition is called the *subalternans,* and the particular deduced from it the *subalterna.* To warrant the deduction, the *subalternans* must be *metaphysically universal, i. e.* the assertion contained in it must be made of the subject in its whole extent: if only *morally universal,* that is, where the assertion is not true of all the individuals in the extension, it is obvious that the *singular subalterna* might happen to be an excluded individual. This condition being secured, the truth of the *subalternans* determines with certainty that of the *subalterna,* and so from the falsehood of the *subalterna,* we conclude that of the *subalternans*; but from the truth of the *subalterna,* we cannot with certainty infer the truth of the *subalternans,* nor from the falsehood of the *subalternans* that of the *subalterna.* The *subalterna* may be true, that is, the predicate may agree or disagree with part of the subject, and the *subalternans* false, that is, the predicate not agree or disagree with the whole of the subject. In other words, we cannot from a true *subalternans* deduce a false *subalterna*; but from a false *subalternans* a true *subalterna* may be deduced. So that, in general, falsehood cannot follow from truth; but truth may follow falsehood.

The *conversion* of propositions is the deduction of one from another. That proposition from which the inference is drawn is called the *convertend,* and that which is drawn is the *converse.* Two things are required for this process; first, that the terms be transposed; and, secondly, that the *converse* follow from the *convertend* by necessary inference. Here the maxim stated above applies. If the *convertend* be true, the *converse* must also be true; but the latter may be true and the former false. The predicate of every affirmative proposition being particular, the *converse* must be so too, as its subject is the predicate of the *convertend.* It follows that a universal affirmative cannot be converted into a universal affirmative; but a universal negative may be converted into a universal negative, because it is asserted in it, that no individual included in the extension of the subject is found among the individuals included in the extension of the predicate. A particular affirmative may be converted into a particular affirmative, but not into a universal affirmative; but as, in a particular negative, we cannot, from the disagreement of the predicate with part of the subject, infer that the subject disagrees with any part of the predicate, we must, to convert a particular negative, connect the negative particle, as formerly suggested, with the *res copulata,* and make the new *res copulata,* so formed, the subject of the *converse.* Conversion is said to be *per accidens,* when the quantity is diminished, as in the universal affirmative.

Propositions may be so related, that if one be true the other must be false. This is the case where in one the predicate is said to agree with the entire subject, and in another to disagree with it in whole or in part. Such are called *opposite* propositions. If they be both universal, the opposition is *contrariety*; if one be universal and the other particular, it is *contradiction*: but in the propositions called *sub-contraries,* where the predicate in one is said to agree with part of the subject, and in another to disagree with part of the same subject, there is no real opposition, the predicate being affirmed and denied of different parts of the same thing; and such propositions, therefore, may both be true. If, in really opposite propositions, the matter be necessary, the affirmative one will be true and the negative false: if it be impossible, on the contrary, the negative will be true and the affirmative false: and, if contingent or possible, the universal will be false, and the particular true, whether affirmative or negative. A compound proposition is said to be *copulative* when it has several subjects and only one predicate, or several predicates and one subject, or several subjects and several predicates connected by a copulative particle. It is resolvable into simple propositions, equal in number to the product of the number of subjects multiplied by that of the predicates. An *adversative* copulative proposition implies opposition between its parts, which are connected by the adversative particle. A *hypothetic* compound proposition consists of two parts, called the *antecedent* and the *consequent,* which are to be distinguished not by their order, but by the *conditional* particle prefixed, which characterizes the antecedent.

Logical *definition* has been said to differ from grammatical, by relating to *things,* while the latter relates to *words*; but, if we consider words as really signs purposely intended to stand for things, even admitting them to be arbitrary, we shall not, in the prosecution of knowledge, or the discovery of truth, be disposed to avail ourselves of so frivolous, if not dangerous, a distinction. Besides, as stated by Dr Reid, if the logician mean, by the definition of a thing, the giving of an adequate conception of the nature and essence of any thing that exists, "this is impossible, and is the vain boast of men unconscious of the weakness of human understanding." For the principles and uses of definition, the reader is referred to Locke, who has treated them in a truly philosophical manner. It is enough to mention here; first, that the first and great law to be regarded is, that a definition be *adequate,* that is, applicable to the whole being defined, and not applicable to any thing else; secondly, that it be *clear,* or immediately discover the nature of the thing; thirdly, that many complex ideas are best defined by a distinct enumeration of all their component parts; fourthly, that when we cannot define our notions or ideas precisely, we must endeavour, by reflecting on them, to observe minutely their agreements and disagreements, which can only be done by a right understanding and proper exercise of those faculties and powers by which they are formed; fifthly, that in order to know whether words be used at any time in the sense in which they have been defined, we ought to substitute the definitions in place of them; and, lastly, supposing our object to be truth and not victory, that we should be careful not only strictly to define our words, but closely to adhere to the senses in which we profess to take them. Closely connected with definition, and, generally speaking, amenable to similar laws, is the *division* of things, and the distribution of the whole of them into all the parts of which they consist. It should be adequate, so that all the parts contained in the whole, and nothing but the parts, should be enumerated; and distinct, so that no one part can be truly affirmed of any other, or one be contained in another. It is essential to a good division, moreover, that it be of the same degree in the categorical or predicamental lines, whatever these may be; as the ten categories of the Peripatetics, formerly alluded to, which may be all reduced to two, viz. *substances*, i. e. "things subsisting by themselves," constituting the first of the *summa genera*, as those categories were also called, and "things not existing by themselves," or *attributes*, which would comprehend all the remaining nine *summa genera;* or the three categories of Mr Locke, viz. *substances, modes,* and *relations,* an arrangement, which, as Dr Reid observes, excludes *time, space,* and *number*; or the two categories of Mr Hume, viz. *ideas* and *impressions*; or the two of a mathematician spoken of by Dr Reid, viz. *data* and *quæsita*; or the two of Peter Ramus, one of which is contradictory to the other,—so that all things are comprehended between them, as it is obvious that any thing whatever is either such a thing or not such a thing; or, lastly, what Dr Reid himself humorously proposes, viz. the addition of an *et caetera* to the last number of the division of any subject imperfectly comprehended.

Such, then, are some of the principal elementary materials made use of in reasoning; and it is quite obvious, that, as they are collected by observation from the various modes in which mankind express themselves, a knowledge and ready use of them must contribute greatly both to the explicit statement of our own thoughts, and the discovery of the real meaning of the language of others. It is also obvious, that several rules might be given for the due employment of them. But though all this be freely admitted, it is improbable in the highest degree, and, indeed, inconceivable, that any artificial arrangement of any of them, or, to come nearer to the point, any *distribution* of propositions, to which, as we see, they all relate, can yield a particle of truth not contained in the propositions themselves, and not to be found therein, by the exercise of common sense, without such arrangement. The system of *syllogistic* reasoning never yet made, and is incapable of making, a single discovery in any department of science, physical or moral, to which it has been or can be applied; but it may be occasionally useful, both in detecting fallacious reasoning, and enabling us, as Dr Campbell, himself, one of its opponents, admits, to adjust our language in expressing ourselves on subjects previously known.

A *syllogism* is an argument, or form of reasoning, which consists of three propositions or different terms, one of which, called the *conclusion*, is inferred from the others, which are called the *premises;* and the nature of syllogistic reasoning is such, that the agreement or disagreement between the subject and predicate of the conclusion is proved from their agreement or disagreement with a third term, called also *middle term*, with which each of them is compared alternately in the premises. The subject and predicate of the conclusion are together called the *extremes;* and of these, the former, or the subject, is called the *minor term*, and the latter, or the predicate, is called the *major term.* The premises are named from these two terms. Thus the premise which consists of the middle term and the subject of the conclusion, or minor term, is the *minor proposition*, or *minor premise*; and that which consists of the middle term and the predicate of the conclusion, or the major term, is the *major proposition*, or *major premise.* The order of the premises in a syllogism is not invariable; but, generally, the *major* is first. The *middle term* is easily distinguished by its appearing in each of the premises, either as subject or predicate, and being absent in the conclusion; and it is the position or situation which the middle term holds in the premises, that constitutes what are called the *figures* of syllogisms. These can only be four in number; 1st, That in which the middle term is the subject of the major proposition, and the predicate of the minor; 2d, That in which it is the predicate of both premises; 3d, That in which it is the subject of both premises; and, 4th, That in which it is the predicate of the major premise or proposition, and the subject of the minor. It is obvious, that, in the first, the major term, or predicate of the conclusion, is the predicate also of the major proposition; and the minor term, or subject of the conclusion, is the subject also of the minor proposition; that, in the second, the minor proposition and the conclusion have the same subject; that, in the third, the major proposition and the conclusion have the same predicate; and that, in the fourth, which, from the unnatural order of the terms, was not recognised by Aristotle, the extremes have a contrary place in the premises from what they have in the conclusion. Syllogisms are also divided according to their *modes*, which are determined by the quality and quantity of the propositions of which they consist, and named by some three of the four vowels formerly used to denote the four kinds of propositions. All the possible modes of syllogism may be found by ascertaining how many different combinations may be made of three out of the four vowels, and these are sixty-four, which, multiplied by three, the number of figures treated of by Aristotle, give 192, or by four, the whole number of figures, give 256. But of the 64 varieties, only 11 are legitimate modes, the remaining 53 violating some of the general rules, and being reckoned paralogisms.

The most important of the general rules of syllogism are three:—1st, There must be no more than three terms in a syllogism;—2. The middle term must be universal in at least one of the premises, and not taken particularly in both, which would be to constitute two middle terms;—3. If one of the extremes be particular in one of the premises, it must be particular also in the conclusion. From which and the preceding rule, it is evident that there must always be one more universal term in the premises than in the conclusion of a legitimate syllogism; and that no term can be universal in the conclusion, which is not universal in the premises;—4. It is obvious that whatever can be universally affirmed or universally denied of any universal term, may be affirmed or denied of every thing contained in that universal term. This principle constitutes the two great rules, styled *de omni* and *de nullo*, on which Aristotle rests the whole system of legitimate syllogisms, and with perfect propriety; for it can be proved, that every legitimate syllogism is reducible to four *perfect* modes of the first figure, in which alone the *necessity of the consequence* is immediately apparent, as resulting from these two rules, or the conclusion necessarily and obviously follows from the premises. In short, a perfect syllogism must not only be in the first figure, but its premises must be AA, or EA, AI, or EI, and the conclusion must have the quality of the major proposition, and the quantity of the minor; so that in these cases it will be respectively A, E, I, O. Examples of these will illustrate the system.

1. AAA. All rational beings are accountable for their actions.
All men are rational beings.
Ergo, All men are accountable for their actions.
2. EAE. No irrational beings are accountable for their actions.
All brutes are irrational beings.
Ergo, No brutes are accountable for their actions.
3. AII. All rational beings are accountable for their actions.
Some animals are rational beings.
Ergo, Some animals are accountable for their actions.
4. EIO. No irrational being is accountable for his actions.
Some animals are irrational beings.
Ergo, Some animals are not accountable for their actions.

Inspection of these examples, to the modes of which all other forms of legitimate syllogism may be reduced, will satisfy any one that the connexion between the premises and the conclusion is so intimate and real that no proposition can be needed to make it more apparent; in other words, the conclusion exists in the premises, and can be discovered in them by any person of common understanding who comprehends their meaning, without aid from the system. It can have no pretensions, therefore, as an instrument for the discovery of truth, or the prosecution of science; but, an acquaintance with its rules will amply repay the small labour required to understand and to practise it, by the facility with which it exposes sophistry, and the precision and force which it will impart to argument.

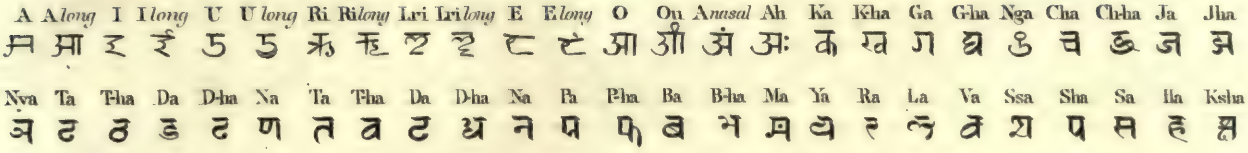
Language being the representation of our thoughts, ought to correspond with them; and hence the principles of *grammar* have their foundation in our nature, as well as those of logic. That quality of style which is denominated *purity* may therefore be held synonymous with grammatical truth; and this may be defined "the conformity of the expression to the sentiment of the speaker or writer," as logical truth is "the conformity of the sentiment to the nature of things." But there is a material difference between logic and grammar, in the circumstance of the former being universal, or common to all languages, whereas the latter, though it proceed on certain general principles, is essentially particular. The general principles have been enumerated in treating of the origin and progress of arbitrary language, and may be recapitulated in a single sentence.—Verbs, with all their variety of moods, tenses, and persons, and nouns, adjective and substantive, with all their genders, numbers, and cases, are expressive of a like variety in the modes of thought; and the adjuncts of time, place, circumstance, relation, dependence, or whatever else is not thereby designated, are distinguishable by the natural faculties, and are to be expressed either by modifications of these words, or by new ones invented for the purpose. Three rules require to be complied with, in order that grammatical truth, or purity, be attained in any language; 1. The words must be those of the language; 2. Their arrangement or construction must be according to the genius, constitution, and idiom of the language; 3. The words, taken singly, and in combination or sentences, must be employed in the exact sense which custom, or the general recognized usage of the language, has affixed to them.

Elocution relates to the delivery of language, and, besides implying the principles of composition, is one of the best tests to which it can be subjected, in order to determine its propriety and impressiveness. On this account, alone, to say nothing of any other claim, it merits far more attention than has generally been bestowed on it in modern times; and, accordingly, some remarks, intended to support its utility, were hazarded on it in the article EDUCATION. Since that article was written, Mr Roberts, teacher of the art in Edinburgh, has endeavoured to establish it as an intellectual recreation, by exhibiting its various excellencies in public; and, certainly, judging from the distinguished patronage he has received, as well as the proof he has given of talent and power, we are disposed to augur favourably of the enterprise. His "Guide to Elocution" is remarkable for simplicity, a virtue of high worth, where the temptation to be very profound is proved to be strong, by the example of so many ingenious labourers in this department of literature.

Under the head of *versification*, notice will be taken of the different modes of arranging words, with a view to pleasurable excitement and poetic effect; and the opportunity will then be taken to do justice to the peculiar character of Hebrew poetry, as explained by Bishop Lowth, and still more recently illustrated by Mr Jebb, who has ably contended for the existence and employment of the same principles in another portion of the sacred writings. The work of the last mentioned gentleman is one of the most interesting acquisitions which philology has made within the last half century. One proposition apparently demonstrated in it is so remarkable, as to merit the most explicit and the earliest communication, and with it we shall terminate this essay. Hebrew poetry, under which may be comprehended much of the New Testament, is universal poetry, the poetry of all languages and of all people, and is perfectly transfusable, by mere literal translation, into every known tongue; a peculiar and distinguishing excellence, from which it is no less philosophical than an act of piety to infer the universality of that benevolent purpose in which it had its origin, and to accomplish which it has been so marvellously preserved from corruption and oblivion, amid the wickedness of men and the vicissitudes of all earthly things.

LANGUAGE

PLATE 108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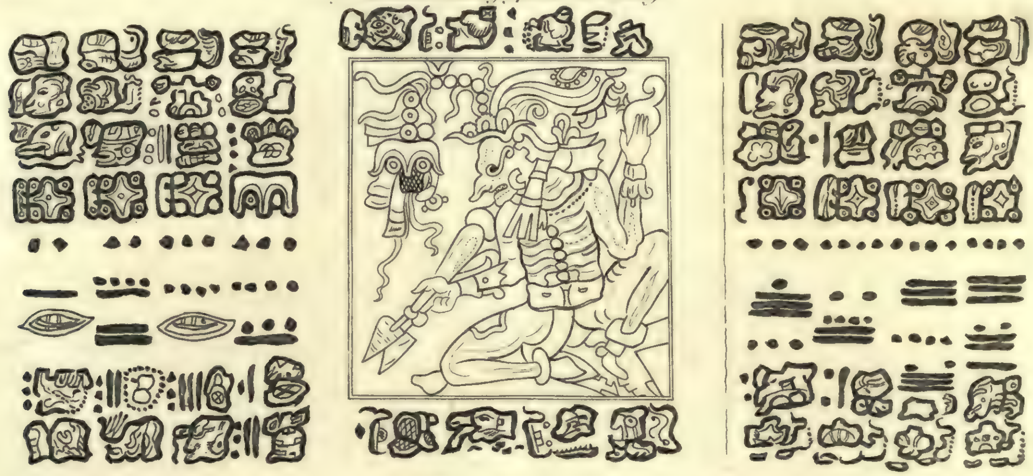
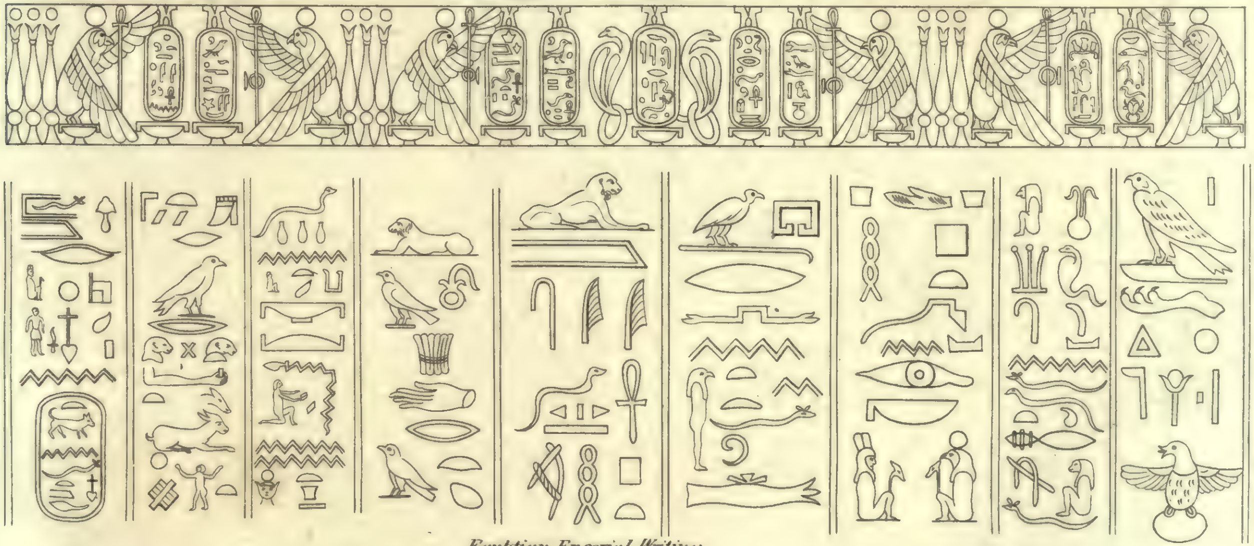
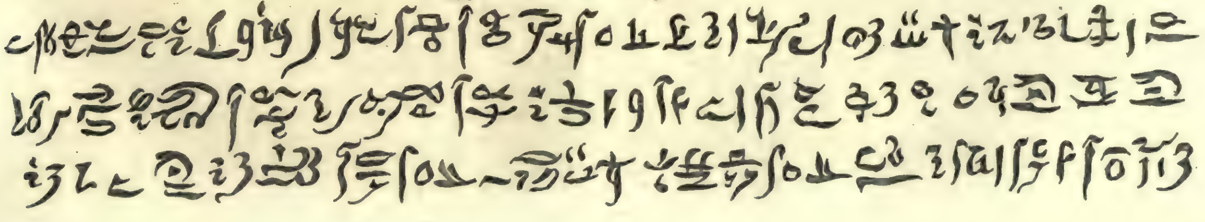
Mexican Hieroglyphics & Writing



Egyptian Hieroglyphics



Egyptian Encorial Writing



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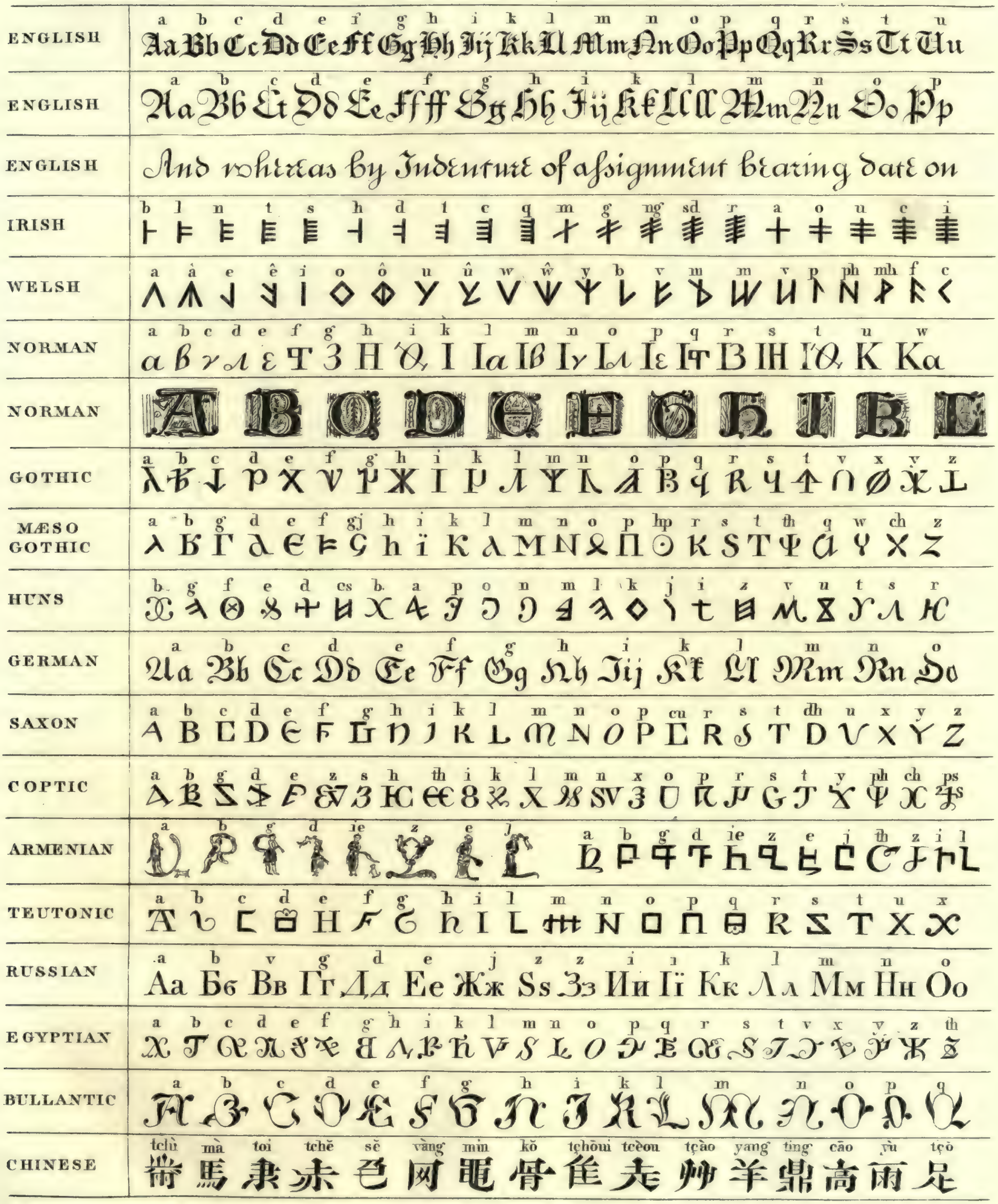
LANGUAGE.

PLATE 109


ENGLISH
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Aa Bb Cc Dd Ee Ff Gg Hh Iij Kk Ll Mm Nn Oo Pp Qq Rr Ss Tt Uu
ENGLISH
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GOTHIC
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MÆSO GOTHIC
a b g d e f gj h i k l m n o p hp r s t th q w ch z
HUNS
b g f e d cs b a p o n m l k j i z v u t s r
GERMAN
a b c d e f g h i k l m n o
Aa Bb Cc Dd Ee Ff Gg Hh Iij Kk Ll Mm Nn Oo
SAXON
a b c d e f g h i k l m n o p cu r s t dh u x y z
COPTIC
a b g d e z s h th i k l m n x o p r s t y ph ch ps
ARMENIAN
a b g d ie z e j
a b g d ie z e j th z i l
TEUTONIC
a b c d e f g h i l m n o p q r s t u x
RUSSIAN
a b v g d e j z z i ı k l m n o
Aa Бб Вв Гг Дд Ее Жж Ss Зз Ии Іі Кк Лл Мм Нн Оо
EGYPTIAN
a b c d e f g h i k l m n o p q r s t v x y z th
BULLANTIC
a b c d e f g h i k l m n o p q
CHINESE
tchù mà toi tchĕ sĕ vàng min kŏ tchōui tcēou tçào yang ting cāo yù tçò

Drawn & Engraved by W.H.Lizars for the Encyclopædia Edinensis

LANGUAGE **PLATE 109. No. 2.**

TABLE OF ORIENTAL ALPHABETS.

	PERSIC.							ARABIC.							SYRIAC.				ETHIOPIC.			SAMARITAN	CHALDEE and HEBREW.		
	Numeral Power.	Sound.	Form Final. Connect	Form Final. Unconnect	Form Medial. Connect	Form Initial. Unconnect	Name.	Numeral Power.	Sound.	Form Final. Connect	Form Final. Unconnect	Form Medial. Connect	Form Initial. Unconnect	Name.	Form Final.	Form Medial.	Form Initial.	Name.	Order.	Form.	Name.	Form.	Numeral Power.	Form.	Name.
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3		p	ـپ	پ	ـپـ	پـ	Pē																		
4	400	t	ـت	ت	ـتـ	تـ	Tē	400	t	ـت	ت	ـتـ	تـ	Ta					ሀ h						
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6	3	jEng.	ـج	ج	ـجـ	جـ	Jīm	3	j	ـج	ج	ـجـ	جـ	Jim	ـܓ ܓ	ـܓـ	ܓـ	Gomal	ሐ kh	ገ	Geml	ࠂ	3	ג	Gimel
7		ch	ـچ	چ	ـچـ	چـ	Chē or Chīm												መ m						
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א מאב אהב עדנבורג
Edinburgh 1820, 1st August.

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900 ץ Tsade. 800 ף Phe. 700 ן Nun, 600 ם Mem, 500 ך Caph, FINALS.

Jas. Noble invt

W. H. Lizars Sculpt

Engraved for NOBLE'S Arabic Vocabulary

LANGUEDOC, a maritime province of France. The mountains of Auvergne and Lyonnois bound it upon the north; the Rhone separates it from Provence and Dauphiny, on the side of the Levant; Gascony bounds it on the west, and on the south the Mediterranean sea. The country is fertile in fruits, corn, and wine; also in medical plants, kelp, iron, and marble. Thoulouse is the capital; and the clergy of this province, three archbishops and twenty bishops, are considered as the most opulent in France.

LANIARD, (LANIER, *Fr.*) a piece of cord fastened to various machines in a ship, and employed to extend the shrouds and stays of the masts, by communicating with the dead-eyes.

LANIUS, the shrike or butcher-bird. See ORNITHOLOGY.

LANTERN, or LANTHERN, a box-case used for carrying a lighted candle. It is generally constructed of white iron, and has openings or panes, commonly of glass, for transmitting the light. A dark lantern has only one opening, which may be closed up or not as occasion requires. In China, the Feast of Lantherns, so called from the number of lanterns hung out of the houses and streets, is celebrated on the 15th day of the first month. Some of them are of an amazing size, and beautifully gilded; and in these the people receive visits and give entertainments. In architecture, lantern is a small dome, on the roof of the building, for admitting light. For *Magic Lantern*, see MAGIC.

LANUGO, the down of plants, like that of the peach.

LAOCOON, the priest of Apollo, son of Priam and Hecuba, who, when sacrificing a bullock to Neptune, beheld two enormous serpents issue out of the sea, and attack his two sons at the side of the altar. The father immediately put forth all his strength in their defence; but the serpents turning upon him, and folding him in their complicated wreaths, squeezed him till he expired in the greatest agonies. It is said, that this was a punishment inflicted on him because he urged the Trojans not to bring into the city the wooden horse consecrated to Minerva, and for hurling his javelin against its sides as it entered within the walls. The memory of this shocking event has been perpetuated by one of the finest monuments of Grecian sculpture. The statue was the united production of the three famous artists of Rhodes. It was found in Rome, in the ruins of the palace of Titus, early in the sixteenth century, and during the French revolution was removed from the Vatican to the Museum of Arts at Paris, but of late it has been restored to its ancient place. The intolerable agony of bodily pain, united to the highest degree of mental anguish, the eyes being turned towards heaven in search of relief, less for himself than for his children, are all exhibited here with a force and dignity that can never be excelled.

LAODICÆA, on the Lycus, a town of Phrygia, so called from Laodice, the consort of Antiochus its founder, and rendered memorable as one of the Seven Churches addressed by St John in the Apocalypse.

LAODICÆA ON THE SEA, also a town of Seleucis in Syria, with a safe and convenient harbour. The country around it is fertile, and yields abundance of wine.

LAOMEDON, king of Troy, who built the walls of Troy, in which he was assisted by Apollo and Neptune.

LAON, the capital of Laonis, in the isle of France, with a castle and bishop's see.

LAOS, or LAOS LAO, a kingdom of Asia, in the peninsula of India, bounded by China on the north, by Tonquin and Cochin-China on the east, by Cambodia on the south, and on the west by the kingdom of Siam and the territories of the king of Ava. The inhabitants are chiefly employed in agriculture and fishing. Mild in their tempers, they possess a robust constitution, are of an olive complexion, and being idolaters are extremely addicted to superstition. This country abounds in forests, and is fertile in rice, fish, and fruits. The public revenue arises from elephants teeth; and the king exhibits himself in the presence of his subjects twice a year. The capital town is Langan or Langione.

LAPIDARY, an artificer who cuts precious stones.

Various machines are used in cutting and polishing these substances, according to their hardness or quality. The diamond is cut on a wheel of soft steel, with diamond dust and olive oil. The topaz, sapphire, and ruby, are cut on a copper wheel after the same manner, and are afterwards polished, on another copper wheel, with tripoli and water. The emerald, amethyst, hyacinth, garnets, and agates are cut on a leaden wheel with smalt and water, and polished with tripoli on a tin wheel. The opal and girosol are cut and polished on a wooden wheel with tripoli also.

LAPITHAE, an ancient people of Thessaly.

LAPITHUS, son of Apollo, and brother of Centaurus. The battle of the Centaurs and Lapithae, originating in a marriage entertainment, is beautifully described by Hesiod and Ovid. The Lapithae, in fabulous history, are represented as the inventors of bits and bridles for horses.

LAPLAND, subject to three different powers, is the most northerly country of Europe. Norwegian Lapland, belonging to Denmark, is situated between the river Pais, lake Enarak, and the Northern sea. It is subdivided into the provinces of East and West Finmark and Norland. Swedish Lapland, including all that district from the Baltic to the mountains that divide Norway from Sweden, includes six districts, which derive their names from different rivers, namely, the Pitea, Elma, Sulas, Torna, Kiemi, and Aungnermanland. Russian Lapland comprehends that march or territory which lies to the east of the river Tornea, one part of which stretches along the north coast, another along the White sea, and the third runs inland to lake Enarak. The largest and most considerable of these three countries belongs to Sweden, although they are all inhabited by the same people.

General aspect.—Lapland, in appearance, may be considered as a huge collection of terrific rocks and stupendous mountains, from the rugged prospect of which the eye is relieved by many delightful vallies, whose meandering rivulets discharge themselves into lakes and rivers which at last empty themselves into the gulf of Bothnia. Pleased with the beauty and variety of those charming scenes, the natives imagine this to be the real terrestrial paradise; and indeed so beautifully ornamented, in many places, are these vast mountains, with so many forests, lakes, and rivers, that, were the climate at all times equally enchanting, they might be justified in their preference. On the banks of these rivers, and the margins of these lakes, may be seen roses blowing uncultivated, having all the glow of colour, and all the sweetness of smell, possessed by those that are seen in our finest and best cultivated gardens. As a contrast to these picturesque scenes of nature, a large portion of the low country is clothed with extensive woods of the brown dusky pine and the fir, skirted with broad morasses and stagnant waters, which, in the hot season of summer, give life to myriads of insects, that are more intolerable than even the winter cold. The face of nature in this country during winter is extremely bleak, and nothing is any where to be seen but snow, which covers both mountain and valley to the depth of four or five feet.

Climate.—The extremes of heat and cold are here to be felt in their full force. During winter, towards the northern extremity, there is an uninterrupted night for the space of three months, during which the cold is so intense that it freezes brandy, and even the watery part of the spirit of wine, if not rectified very highly. On all the rivers and lakes the ice is of prodigious thickness, and even in spring and autumn the tops of the mountains are so much exposed to tempests of snow and hail that no tree will grow near the summit; although in summer, towards the north, the sun never sets for three months, their summer day being of that duration. When thaw prevails, the climate is moist and rainy, and the atmosphere is surcharged with damp and vapour; but when frost commences, and the north wind blows, the sky is without a cloud.

Productions.—So chilled and barren is the soil of this country, in consequence of the melting of the snow and the intensity of the cold, that it produces little or no grain of any kind, unless in a few detached places, where a scanty crop of rye may be found. It abounds with a great variety of berries, such as black currants, rasp, cran, juniper, and bilberries; also with trees of various kinds, which grow, in the more sheltered situations, to a very considerable size. Among these are the pine, the birch, and the fir; also the service-tree, the poplar, the elder, and the willow. Many plants of an antiscorbutic nature are to be found in great plenty, and herbs of various kinds peculiar to the country; also grasses fern, heath, and moss, together with the *lichen rangiferus,* a vegetable on which the rein-deer is entirely supported during winter, and which is even used by the natives in broth as a cordial and restorative for the sick. Some kinds of it afford a soft and wholesome bed for children.

Zoology.—The different species of animals found in Lapland are very numerous. The inhabitants are constrained, in their own defence, to carry on almost a constant war against wolves and bears; and no exploit more honourable can be atchieved by a Laplander than the destruction of these animals. Besides beautiful martins and squirrels, and the glossy sable, whose skin is so extremely valuable, here is abundance of ermines, hares, weasels, elks, beavers, and otters. But the most remarkable of all the animals, and the most invaluable to the natives of this country, is the rein-deer, (See MAMMALIA: *Cervus*) which, in summer, is fed on grasses and alpine plants, and in winter on *lichen rangiferus,* a plant so abundant in this country as to cover all the face of the ground for several miles.

Of wild fowl there is abundance, as bustard, heath-fowl, grouse, partridge, pheasants, lapwings, swans, wild geese, and ducks; and among the rocks and mountains are to be found vast numbers of eagles, falcons, kites, and hawks, with various other birds of prey. The rivers yield a plentiful supply of delicious fish, some of them of exquisite flavour and surprising size, such as the salmon, bream, trout, and perch. But so numerous and so dreadful are the swarms of insects which issue forth out of the weeds and morasses during the heat of summer, that while the rein-deer are obliged to fly to the tops of the mountains, the inhabitants betake themselves to the sea-coast, in order to escape the attacks of these pestilent vermin. So large and powerful are some of these flies, that wherever they strike the skin the blood flows copiously from the wound. Nothing can defend the inhabitants from their fury but kindling a large fire, and getting enveloped in the smoke.

Mineralogy.—But if the face of nature in this northern region be to all appearance barren and unproductive, the bowels of the earth are enriched with many valuable minerals and precious stones. In the district of Zarno are two mines of copper; and in some other provinces are rich veins of silver and gold mixed, besides strata of excellent iron. Here also are to be found the topaz, the amethyst, and crystals, so hard and fine, that, in beauty and lustre, they are very little inferior to the diamond. In some of the rivers are pearls, which, though generally pale in colour, are in many instances as bright and large as those of the east.

Inhabitants.—The people are of a robust and hardy race, capable of enduring incredible fatigue, but of low stature, having large heads and coarse features. From this general description many of the women may be considered as an exception, being of a superior form and more delicate complexion. In their manners the Laplanders are hospitable, honest, and simple; and although timorous in warlike pursuits, they are enterprising as travellers over these frightful precipices, and as sailors in exposing themselves, amidst cataracts and whirlpools, in boats of slender construction, fastened together with twigs of osier, or the sinews of animals taken in the chace. Of a roving unsettled disposition, they generally live in rudely constructed tents, formed of trees or poles, in the shape of a cone, with an opening in the centre for the smoke, whilst the floor within is covered with branches of trees or mats. Each side of the fire-place is divided into three chambers by logs of wood, and the innermost is occupied by the husband and wife, the next by the children, and the other by the servants. The sheep and cattle are usually housed under the same roof, and enter at the same door, with the family. Such is the summer residence of the Laplander; but their winter habitations are more substantial, often built of stone and turf, roofed with beams, and covered with bushes, turf, and earth. Lest a door, however, should give admission to too much cold, they enter at a small passage, through which they find it necessary to creep on hands and feet; and to make the inside comfortable, and prevent the bad effects of damp, they cover it wholly with skins and mats. One house is often so large as to contain 12 families, each separated from another by partitions of skins, after the manner of stalls in a stable. The windows are formed of the intestines of seals neatly joined, and there is a clear passage from one end of the house to the other. Raised above the floor about 18 inches, is a broad bench, on which they sit during the day and sleep during the night; and at the post of each division hangs a small lamp formed of chalk or soft marble, in which they burn the oil of seals with moss instead of cotton. This not only gives light but also warmth, and with these they often cook their victuals.

Nothing can be more simple than their furniture, which consists of kettles of copper and of iron, bowls, cups, and spoons of wood, and sometimes, but seldom, a few vessels of tin or even of silver. At meals each has his particular portion and dish, when a mat is spread on the bench, and they begin and end their repast with pronouncing a solemn blessing. Till of late they were utter strangers to the use of bread, substituting in place of it dried fish and the inner rhind of the pine reduced to powder. The eggs of water-fowl offered them an abundant supply of food during spring; in summer and autumn they live on the birds themselves; and in winter their food consists of fish dried in the sun, and the milk and flesh of the rein-deer. Temperance and exercise constitute their chief defence against disease, and their strength and vigour often continue unimpaired for the space of an hundred years.

During the heat of summer they are clothed in a long garment, of coarse fabric, which reaches nearly to the ancles, and is fastened round the middle of the waist with a broad girdle, ornamented with rings and chains of brass, having attached to it a pouch for carrying tobacco, flints, and other articles, and from which there usually hangs also a large Norway knife, necessary in all hunting and fishing excursions. They are strangers to the use of linen; but the higher ranks wear garments of a fine texture, and of a great variety of colours, the most glaring of which are generally preferred. Their heads are defended from the cold in winter by caps of the skin of water-fowl with the feathers on, and their feet with shoes made of the skin of rein-deer, having the hair turned outwards; and indeed their whole body is generally cased in coats, boots, and gloves of the same materials. The Laplander being obliged to tend his herds of rein-deer through the woods, both by day and by night, during the terrible cold that reigns there in winter, to protect them from wild beasts, he puts into his boots and shoes, and also into his gloves, the slender-eared, broad-leafed, cyperus-grass, sufficiently dried and rubbed, in such a way as to cover his feet and legs all round. In this manner he defends himself from the cold. The garments of the women are not materially different from those of the men, although they are generally more ornamented. In summer they use blankets of coarse cloth for their beds, and in winter furs. The men are chiefly employed in constructing boats and sledges, in making furniture, bows, and arrows, and in cooking for the family; and the females make all the clothes, boots, and shoes, harness for the rein-deer, and embroider the figures of beasts and flowers on their girdles.

As the snow covers the ground in Lapland during a great part of the winter, the natives are obliged to make frequent excursions from place to place. When they travel on foot, they make use of skaits, or snow-shoes, one of them equal in length to the person that wears it, and the other about a foot shorter. With these fastened on his feet, and a long pole in his hand, he directs his course, and proceeds with amazing velocity over lofty mountains, travelling, it is said, at the rate of 60 miles a-day.

It is but seldom, however, that these journies are accomplished on foot. The Laplander more frequently has recourse to his sledge, or *pulka,* which is shaped like a small boat, with a convex bottom, that it may slide more easily over the snow. Wrapped up in this machine, like an infant in a cradle, and with a stick in his hand to steer it, he proceeds with great rapidity, sometimes at the rate of 70 or 80 miles a-day, without any refreshment for the animal more than he can procure by dipping his nose among the snow.

When the Laplander proposes to enter into the married state, he makes choice of some female acquaintance, and employs some friends as mediators with the father. These take with them several bottles of brandy, and a present for the intended bride. The first application is made to the father; the brandy is drank, the proposal is made, and all the advantages and disadvantages of the intended alliance are discussed. If the lover is agreeable to the parents, he is permitted to enter, and is introduced to the young woman. The lover then offers her a present, and the acceptance of it is interpreted as a consent to the match. Thus agreed, he is at liberty to visit his mistress as often as he pleases, and they often continue to cohabit for two or three years before the formal celebration of the marriage. After the ceremony has been performed publicly by the priest of the parish, the young man is obliged to serve his father-in-law for a whole year, and sometimes longer; at the expiration of which period he retires to his own habitation with his wife and his dowry of rein-deer, when he receives presents from all his friends.

It is said that few of the women of Lapland have a numerous offspring; but so robust and healthy are the females, that in ten or twelve days after childbirth, they are capable of undertaking a journey of many miles to have the infant baptised. Instead of a cradle, the child is placed in a hollow piece of wood, lined with moss, and covered with skin, which, within doors, is hung to the roof, but when travelling is placed on the mother's back. The inhabitants of Lapland being, from necessity, temperate, are in general healthy, and retain much of the vigour of youth to the extremity of old age. They are not altogether exempted from diseases, but their remedies are extremely simple, as they seldom use any other medicine than the decoction of a certain species of moss, and, when this cannot be obtained, the stalk of Angelica, boiled in the milk of the rein-deer. Any fixed pain they remove by the application of a large mushroom, burning hot; and to their wounds they apply nothing but the turpentine extracted from fir.

When the period of dissolution approaches, the Laplander is exhorted to die in the faith of Christ, of which he has, perhaps, but a very imperfect conception; and the moment he draws his last breath, all those by whom he was surrounded take a hurried leave, lest the spirit or ghost of the departed person, which, according to their ideas, remains with the corpse, should do them mischief.

The natives of this country are much addicted to superstition; and although they are Christians by profession, they observe many of the rites and ceremonies of the ancient heathens. When a Laplander is about to be interred, they furnish the deceased with a purse of money to pay the porter who shall open to them the gate of paradise; also with an axe, a flint and a steel, and a flask of brandy, with a piece of dried fish and venison, and any thing else they conceive to be necessary in the course of his journey to the other world. The deceased is also provided with a certificate from the priest, directed to St Peter, and with an image of St Nicolas, the friend of the dead; and the last scene is closed by the interment, when the friends light a fire of branches near the coffin, and express their sorrow in tears and howling, accompanied with extravagant gestures and contortions, as an indication of the violence of their grief. Their notions of the happiness of a future state are very imperfect, which, according to their views, consists in those very pleasures that delighted them here.

Trade.—The commerce of the Laplanders is very limited, and consists chiefly of fish, furs, baskets, and toys, rein-deer, and the cheese they make of their milk, in exchange for which they receive woollen cloth, linen, tin, oil, hides, and flour, needles, knives, tobacco, and spirits.

Revenue.—From a country so bleak and unproductive, no great revenue can reasonably be expected. The produce of the mines forms the chief article, while part of the taxes is paid in rix-dollars and furs. Out of these funds the clergy of Lapland are partly supported, and the remainder is remitted to the respective governments.

Religion.—The Laplanders have lately been converted from heathenish superstition to Christianity, although many of those who are subject to the dominion of Russia are still Pagans. The inhabitants of those districts that belong to Denmark and Sweden profess to be Lutherans. So remote are the churches, even in Swedish Lapland, that the inhabitants, before they can attend divine service, are obliged to travel two or three days. Of late years many of the natives are taught to read and write, and they have now improved so much as to be able to peruse the New Testament, which has been translated into their native tongue.

LAPLYSIA, or Sea-Hare, a kind of marine insect of an oval figure, about two and a-half inches in length and two in diameter, of a lead colour and gelatinous substance, and is to be found chiefly about the shores of Anglesea. It is of so poisonous a nature as to cause the hair to fall off the hands of those who touch it, and so fœtid as to produce sickness. The largest species of sea-hare is about eight inches in length.

LAPSE, the omission of a patron to present to a benefice within six months of the vacancy, when the benefice is said to be lapsed, and the right is lost to the patron; but in England devolves first to the metropolitan and then to the crown, and in Scotland to the presbytery.

LAPWING. *Vid.* Ornithology,—*Tringa.*

LARBOARD, the left-hand side of a ship when the face is towards the head of the ship, the starboard being on the right side.

LARCENY, *Fr.* in common law, a wrongful abstracting or stealing the property or goods belonging to another, which is of two kinds: 1. Great larceny, otherwise simply called theft, when the goods stolen exceed the value of twelvepence, which is felony; 2. Petty larceny, when the article stolen is less than that value.

LARCH-TREE, a lofty tree, so called from Larissa, a city of Thessaly, where it was first known and propagated. Its leaves resemble those of the pine, and it bears a kind of mushroom called agarick, which is of an enlivening quality, and used as a laxative in medicine, when made into a pill called *Hiera cum Agarico.* The gum of this tree is of that sort of turpentine commonly called Venice turpentine; and the bark being possessed of a tanning quality little inferior to the oak, is generally used for this purpose.

LARDNER, Nathaniel, a Non-conformist divine, of distinguished eminence, born, June 1684, at Hawkhurst in Kent, where he had a small paternal estate, and died in the 85th year of his age, in the summer of 1768. After having received a grammatical education he was sent to a dissenting academy in London, and at 16 went to Utrecht for three years, and from thence to Leyden. Having returned to England in 1703, he carried on his clerical studies with great assiduity till 1709, when he was admitted to orders, and a few years after became tutor to Lady Treby's son, and acted as domestic chaplain in that family till her ladyship's death in 1721. Notwithstanding the eminent talents for which this great man was afterwards conspicuous, it would appear that he was not by any means distinguished for popular eloquence, as he did not obtain the approbation or choice of any of the congregations in which he made his first appearance. Owing to his extreme deafness in early life, he was destitute of the power of effecting a proper modulation of his voice, and, as a public speaker, his manner was rather forbidding than attractive. Being called upon by some of his dissenting brethren to preach on the proof of the credibility of the Gospel history, he published two sermons on this subject; and feeling peculiarly interested in the research, he prosecuted this discussion, and in 1727 published, in two 8vo. volumes, the first part of "The Credibility of the Gospel History, or the Facts occasionally mentioned in the New Testament, confirmed by Passages of Ancient Authors, who were contemporary with our Saviour and his Apostles, or lived near their time." This popular and valuable work was highly esteemed by all classes of the clergy, and has rendered the most important service to the cause of Christianity, both at home and among foreign nations, being full of sound criticism and admirable instruction. These and the subsequent 15 volumes of this learned work, with his Jewish and Heathen testimonies, occupied his time for a period of nearly 43 years.

His biographer, Dr Kippis, remarks with great propriety, in speaking of the Supplement to the Credibility, that he could not avoid strongly recommending this work to the attention of all young divines, and that it ought to be read by every theological student before he quits the university or academy in which he is educated. As a theological writer, Dr Lardner is universally allowed to hold the highest rank. His extensive erudition, his powerful reasoning, and his extreme modesty and candour in all matters of controversy, render him, to all future writers on such subjects, a pattern worthy of imitation. As a proof of the good opinion in which these writings were held by the learned Dr Watson bishop of Landaff, he has given the Supplement to the Credibility a place in his excellent collection of treatises in divinity intended chiefly for the instruction and improvement of the young clergy.

LARES, (from *lar familiaris,*) domestic divinities, or household gods, among the ancients, worshipped in families, and supposed to preside over household affairs.

LARGE, a term used by sailors when the wind crosses a ship's course in a direction so as to favour its progress, and is opposed to sailing close-hauled.

LARGESS, or LARGITIO, a distribution of provisions, clothes, and money to the Roman people, given first by Gracchus at a very low rate, and afterwards by Claudius gratis.

LARGS, a small town on the Clyde, opposite the island of Bute, rendered memorable by the defeat of the Norwegians in their last invasion in 1263. The remains of the entrenchments of their camp are still visible on the shore.

LARIX, the larch-tree,—see PINUS.

LARK, ALAUDA,—see ORNITHOLOGY.

LARKSPUR, see DELPHINIUM, BOTANY, *Trignia.*

LARVA, an insect in the caterpillar state,—see ENTOMOLOGY, *Index.*

LARVŒ, from *lar* or *lars,* from the Hetruscan word prince or lord, denoting the ghosts of the deceased considered as demons. In his discourses on miracles, Mr Farmer avails himself of the etymology of this term, to show that the heathen demons were ghosts of persons deceased.

LARUS,—see ORNITHOLOGY,—*The Gull.*

LARYNX, upper part of the wind-pipe,—see ANATOMY.

LACERPITIUM, LAZAR-WORT, a genus of plants of the Pentandria class,—see BOTANY.

LASH, or LACE, signifies to bind or make fast, a term chiefly used at sea.

LASSITUDE, in medicine, a morbid sensation, a frequent symptom in acute distempers, often occasioned by too great consumption of the fluids.

LAST, a measure of fish, corn, wool, leather, pitch and tar, flax and feathers, and sometimes the lading of a ship; termed also lastage or lestage. It is applied also to the block on which boots and shoes are formed.

LATERAN, originally an ancient palace in Rome, now the place on which it stood. The councils of the Lateran, five in number, were held in this place in 1123, 1139, 1179, 1215, and 1513.

LATEWAKE, a funeral ceremony observed in Scotland, but now generally abolished, except in the Highlands, where the relations meet at the house of the deceased, on the evening after his death, attended by the music of the bagpipe; and the nearest of kin, amidst violent lamentations, begins the dance, which generally continues till morning. A similar practice continues in some parts of Ireland, where it is often productive of much disorder and intemperance.

LATH, a thin narrow slip of wood, generally used to support the plaster on the roof or ceiling of rooms.

LATH-BRICKS are 22 inches by six, chiefly used in England for drying malt, and have this advantage, that they retain the heat long, and are not liable to fire.

LATHE, an apparatus for turning wood, metals, and other materials, of very ancient use, the invention of which has been ascribed by some to Zalus, grandson of Dædalus, and by others to Theodore of Samos. It is formed of two wooden sides, parallel to the horizon, with a groove between; and below these are two sliding pieces of wood called puppets, which can be easily fastened at any point, and between which the article to be turned is fastened. It is turned rapidly round, contrary ways, by means of a cord put round it, and which is fastened below to a treadle moved by the foot, and above to the end of a lath or elastic pole. The velocity of the machine is so great that it performs 1200 revolutions in one minute.—See TURNING.

LATHYRUS, a genus of plants of the Diadelphia class,—see BOTANY.

LATIMER, HUGH, bishop of Worcester, an eminent reformer, born 1480 at Thurleston in Leicestershire. Being an only son, his father, a yeoman, sent him, when a youth of 14, to the university of Cambridge, where, in due time, he was honoured with the degree of batchelor in divinity, and for some time held the appointment of keeper of the cross to that university. In early life he was a zealous Papist, but after his mind became more enlightened by cultivation he adopted the Protestant faith; when being accused of propagating heretical doctrine, he was ordered to appear before Cardinal Wolsey, and obliged to subscribe certain articles of faith in some degree contrary to his real belief. Such, however, was the opinion Wolsey formed of his talents and character, that he was permitted to retire almost without a single reproof; and having been called upon soon after to preach before his Majesty at Windsor, he soon became a favourite at court, and through the friendship of his patron Dr Butts, and of Cromwell the prime minister, he was appointed to the rectory of West Kingston in Wiltshire; and although frequently harassed by those who favoured the Popish doctrines, he was, in 1535, presented to the bishopric of Worcester, when, having refused to assent to the act of the six articles, he resigned his office, but was soon after seized and committed to the tower, where he remained till the death of Henry the VIII. in 1547. Released, but not restored to his former dignity, during the short reign of young Edward, he was doomed, by the bloody Mary, to suffer with Cranmer and Ridley, and, as a heretic, was condemned and led to the stake, and burnt alive, on the 16th September 1554. At this most affecting scene, the spectators burst into tears. Fastened to the stake with an iron chain, when the executioner brought a burning faggot and laid it at Ridley's feet, Latimer comforted him and said, "Be of good comfort, Master Ridley, and play the man, we shall this day light such a candle, by God's grace, in England, as I trust shall never be put out." The flames spreading rapidly, he soon expired, recommending his soul to God. In his general character he was pious, learned, virtuous, and brave. He was the author of several works: 1. Sermons, 1535; 2. Letters, 1580; 3. An Injunction to the Convent of St Mary's in Worcestershire. See Burnett's *History of the Reformation.*

LATIN, the language of the ancient Romans, first spoken in Latium and afterwards at Rome. At the beginning it was chiefly derived from the Greek, and in time was greatly improved by wars and foreign commerce, till at length it reached its greatest purity and vigour in the Augustan age. Some recent observations by Galiffe and others seem to prove a remarkable connexion between the Latin and the Sclavonic or Russian languages.

LATITUDE, breadth or wideness.

LATITUDE of a place, in geography, the distance of any place north or south from the equator, marked on the meridian of the artificial globe, and on the sides of all maps. In navigation it is the distance of a ship from the equinoctial line either north or south; and when a ship sails to or from the equinoctial line, her way thus gained is termed her difference of latitude. Latitude of a star, in astronomy, is the distance of a star north or south from the ecliptic, being an arch of a circle of longitude from the ecliptic towards either of its poles. Apparent latitude is the distance of the seeming place of any planet from the ecliptic, and true latitude the distance of its real place from the same ecliptic.

LATITUDINARIAN, one whose principles and practice are too loose in regard to religion.

LATIUM, ancient geography, that district of country first inhabited by the Latins, or people whom Virgil calls Latini. Their name was originally derived from Latinus, who, about the time of the Trojan war, reigned over them as king.

LATMUS, in ancient geography, a mountain of Ionia.

LATONA, a Pagan goddess, a favourite of Jupiter, and celebrated for her beauty. She was the daughter of Cœus, and mother of Diana and Apollo.

LATRUNCULI, a game among the Romans, like that of chess. The men are black and white, and composed of glass or wax, and were called *latrones* and *calculi.*

LAUD, WILLIAM, archbishop of Canterbury, son of a clothier at Reading, was born in 1573, and completed his classical education at St. John's college, Oxford. He took orders in 1610, and in 1621 was appointed bishop of St. Davids. Having been translated to London in 1628, he became not only bishop of London, but chancellor of the university of Oxford in 1630, after which period he used every means in his power to adorn the buildings of that university, and to enrich them with books and valuable manuscripts. The churches he caused to be ornamented with pictures, images, and altar-pieces, that the church of England might vie in the externals of religion with that of Rome.

Having attended his Majesty to Scotland, and become a privy-counsellor for that kingdom in 1633, he resolved to bring the churches of both kingdoms to an exact conformity with each other. He was promoted to the see of Canterbury the same year, and caused the Book of Sports to be revived by his Majesty's authority, and was accused of prosecuting such clergymen as refused to read it in their churches. Against those who were suspected of Puritanical principles he was still more severe, causing some of them to be fined, whipped, and imprisoned. He used all his authority to compel foreigners who should settle in his Majesty's dominions to conform to the church of England. In 1735, he became a member of the great committee of trade, and one of his Majesty's commissioners of the revenue, and soon after lord high-treasurer of England. He passed a decree to restrict the press from the publication of all books that were not licensed either by the archbishop or bishop of London, or their chaplains, or by the chancellors of the universities of Cambridge or Oxford.

When the new Parliament met on the 13th April 1640, the Commons were loud in their complaints against the archbishop, and refused to grant any supply till their grievances should be redressed; and the Parliament was dissolved on the 7th of May without accomplishing the object it had in view. Soon after, the storm which had threatened long began to burst. In December of the same year, Archbishop Laud was impeached of high treason at the bar of the House of Lords by the second son of John earl of Clare; and on his way to the tower, to which he was committed, he was doomed to hear the execrations of the exasperated populace. His imprisonment lasted nearly three years; and being brought to trial for subverting the laws, and endeavouring to overturn the Protestant religion, he was condemned and beheaded on Tower-hill, in the 72d year of his age, in 1645. He was the author of several sermons and other works.

LAUDANUM. See *Opium* in MATERIA MEDICA.

LAUDS, or LAUDES, praises, which consist chiefly of psalms and hymns, the second part of the office of the breviary said after matins.

LAUGHTER, an affection of the nerves and muscles of the face or countenance, peculiar to man. It enlivens the countenance, and is produced by some pleasing sensation of the mind. Philosophers have differed materially in their ideas of the exciting causes of this passion. According to Hobbes, it is a "sudden glory arising from some sudden conception of some eminency in ourselves by comparison with the infirmity of others." Hutchison considers it occasioned by "the contrast or opposition of dignity and meanness." Dr. Beattie, in his Essay on Laughter and Ludicrous Composition, thinks wit and humour not always essential to produce laughter, although they frequently do so. When the subject is grave, many compositions may be witty that do not excite laughter. Dr. Beattie has divided laughter into two kinds, animal and sentimental. The first of them may be communicated by sympathy, and is often excessive. The latter, although always pleasing and delightful, is never violent or extreme; the one arises from an agreeable sentiment or emotion of the mind, occasioned by some pleasing idea or object which it contemplates, and the other from some unexpected or sudden power operating on the animal spirits, arising perhaps from some material cause. The best theory on this subject is still a matter of controversy.

LAUNCESTON, a populous trading borough town, the capital of Cornwall, on the river Tamar, 213 miles from London, governed by a mayor, recorder, and eight aldermen. It had a noble castle, which is now in ruins, but the tower still serves as a prison. The spring assizes are held here, the summer assizes at Bodmin or Truro. Here is a handsome church dedicated to St. Mary Magdalene, enriched with carved ornaments; also a free school founded by Queen Elizabeth; and a little without the town are the remains of an old priory. In 1811, the population was 1758.

LAUREL, crowned with laurel, as a poet laureate. Among the ancients, laurel crowns were usually worn by conquerors in token of victory. In modern times, the poet-laureate is a member of the king's household, whose duty it is annually to compose an ode on his Majesty's birth-day, and on the new year. So early as Henry the III. and Edward the IV. persons were appointed to this office, first with a salary of 100 shillings and afterwards of 100 merks per annum. By letters-patent in the reign of Charles I. the salary was raised to L 100, with the addition of a terse of Canary Spanish wine from the king's stores.

LAUREL,—see BOTANY, *index*,—a shrub that is ever green; in a figurative sense, a token of triumph or victory; also the name of a gold coin by James I. 1619, with the king's head laureated. The laurel was consecrated to Apollo, because his favourite Daphne, the daughter of Venus, a river of Thessaly, was converted into a bay or laurel. From many ancient monuments, it appears that the tripod of this god was made of this kind of wood, and he is always represented as crowned with laurel. On public solemnities, the Romans ornamented their gates with the branches of this tree, but especially at the feast of Janus, on the first of January. Even in their nightly dreams, should they see a laurel crown, it was regarded as an omen of riches and honour. All the avenues to their temples were planted with this ever-green, and those who consulted their oracles had their heads surrounded with its branches, and carried them in their hands. Even their victims during their sacrifices were adorned with laurel garlands; and they regarded this plant as a remedy against all enchantments. The crown of laurel was usually the prize bestowed upon ancient poets, who were therefore called poet-laureates, as well as on those who conquered at the different games. According to Nicolas Damascenus, the Lacedæmonians, adorning their heads with this, went forth to battle; and Philip the father of Alexander, when he undertook an expedition against the Phœnicians, caused his soldiers to deck themselves with laurel, and he thus vanquished their enemies the Thebans. This tree, according to Pliny, was a token of peace, and for this reason the *litteræ laureatæ* announced good news. On their medals, victory is often represented as ornamenting their trophies with garlands and crowns of this plant; and Romulus, after he vanquished his enemies, made his triumphal entry into Rome crowned with laurel. See De Berger *de Litteris Laureatis.*

LAURUS, the BAY-TREE, the leaves of which are said to be agreeable to the stomach, and when tunned up with beer give it a pleasant taste.

LAUSANNE, a very pleasant town of the Pays de Vaud in Swisserland. It is beautifully situated on some rising grounds, at a little distance from the lake of Geneva. Since 1536, it has supported a flourishing grammar-school, which, in 1806, was converted into an academical institution with 14 professors and a rector. The number of houses amounts to 1300, with at least 8000 inhabitants. It carries on neither manufactures nor commerce to any extent, and depends for its chief support on the number of strangers from all countries, who are attracted to it by its delightful situation, its refined society, and the advantages of education. Many English families have, since the peace, taken up their residence here and in the neighbourhood.

LAUSATIA, a province of the present kingdom of Saxony, adjoining to Bohemia. At the time of the great northern migrations, it was occupied by a tribe of Sclavonians, whose descendents are still distinguished by their language and manners from the Germans who afterwards settled in the country. They are supported exclusively by the produce of their fields and flocks; whereas the Germans are distinguished by their art, industry, and manufactures, which are carried on to a great extent in the villages situated in the mountainous part of the country contiguous to Bohemia, many of which contain from 3000 to 5000 inhabitants. All kinds of linen goods were formerly wrought, but this branch of industry has now in a great measure been superseded by the cotton manufacture. In this country, the feudal system is still in full force, and a great proportion of the peasantry is in the condition of *adscripti glebae.* They have stated services to perform to their lords, which they cannot avoid without paying a ransom; in other respects, they enjoy the full protection of the laws. The nobility are a privileged class, all the power being in their hands; and to serve their influence as a body, when estates come to be sold, they have a preference as purchasers, to the exclusion of the commons. In these circumstances, civilization and improvement make but little progress.

LAVA, that stream of liquid mineral substances discharged from the mouths of burning mountains. See SICILY, also VESUVIUS and VOLCANO.

LAVANDULA, LAVENDER, a genus of the Didynamia class of plants, and used for distilling and other purposes; given frequently in palsies, vertigos, and lethargies; and the distilled oil of which was celebrated for destroying the *pediculi inguinales*, and other cutaneous insects. See BOTANY.

LAVATER, JOHANN KASPER, a celebrated physiognomist, was born, 15th November 1741, at Zurich in Switzerland, where his father was an eminent physician. When a boy he gave no indications of any extraordinary reach of capacity, and made but little progress in his early studies. He was remarkable for a vivid imagination, which made him shun the society of his playmates, to enjoy, in seclusion, its fanciful creations. He delighted to indulge in meditation of a sacred nature, to read the Bible, and to pour out his heart in prayer. His thoughts were in consequence directed to the church; and in preparing himself for the duties of the sacred character, he prosecuted his studies with zeal and success. He was soon distinguished among his companions for an extraordinary facility of expression, and by imparting to others the result of his religious experience. To instruct and exhort to piety, were the employments in which he sought delight, and in these exercises he was joined by some young men of the noblest families in the city. Klopstock's muse awakened his great poetical talents, which, from the first, were inspired by feelings of devotion and patriotism. His Swiss Songs, which appeared in 1767, and his "Prospects of Eternity," which followed shortly after that period, formed the ground-work of his fame, and procured him many admirers. In 1769, he was appointed deacon of the church of the orphans in his native city, and afterwards rose, by successive gradations, to the cure of St Peter's in 1786. His sermons, of which several volumes have appeared since 1772, procured him readers among all classes, and a very extensive reputation in Swisserland and Germany. Since 1769, he had also zealously prosecuted his enquiries concerning physiognomy, which afterwards spread his fame through Europe. His early talent for tracing the movements of the human heart, and his general knowledge of mankind, enabled him, after a short intercourse with any one, to form a correct estimate of his natural disposition and character; and the qualities thus ascertained were, by his lively fancy, readily associated with the external features. It was not, therefore, surprising that he imagined he perceived a more intimate connexion between the external form, and the spirit which animates it, than a cool and deliberate investigation can justify. By an extensive correspondence, he procured from all countries profiles of distinguished men as materials for establishing his theory, and was particularly industrious in collecting copies of the head of our Saviour from every painter to whom he could find access. According to his philanthropic views of moulding mankind to the likeness of Christ, the knowledge of character, obtained from a survey of the countenance, was to form a most effectual instrument for exercising a powerful and renovating influence over them. The result of these studies appeared in a magnificent work, in four quarto volumes, under the modest title of Fragments of Physiognomy. The first edition was published in 1775. A great number of well executed, and, for the most part, correct portraits and profiles of eminent persons by Chodowieck, Lips, Schellenberg, and other young artists, enhanced the value of the work, which was moreover distinguished by the peculiar poetic diction and enthusiastic exclamations with which Lavater's commentary abounds. Traces of genius, penetration, and a deep knowledge of the human heart, are to be discovered here as well as in every thing which he wrote. But the insecurity of the whole fabric could not long remain concealed from the dispassionate observer. In the hands of its admirers, it gave rise to laughable and even dangerous misconceptions, till Lichtenberg (the ingenious illustrator of Hogarth) and other writers in the Gottingen Almanack of 1778, by wit and ridicule, undermined it in the public esteem. Lavater himself, indeed, seems at a later period to have been shaken in his faith, and finding his endeavours to promote the intellectual or moral improvement of mankind in a great measure unsuccessful, his researches were ultimately confined to subjects more immediately connected with the fine arts; but if his theories sometimes were not well founded, it cannot be denied that they were always ingenious.

In consequence of an active correspondence, in cases of conscience, he became the spiritual guide of pious families in every part of Germany; and his frequent journeys on these occasions might be said to resemble the triumphant progress of a prophet; and no Protestant clergyman ever perhaps acquired an equal degree of admiration and esteem. There was something inexpressibly engaging in his appearance and manners. Benevolence and humanity beamed from his countenance, and irresistibly inspired those who beheld him with reverence and love; and even those who, at a distance, regarded him with dislike, were softened into friendship when admitted into his presence. The French revolution filled Lavater at first with joy; but, from the time that the king was murdered on the scaffold, he regarded it with a religious abhorrence, which roused every energy of his soul into activity when it began to penetrate into his native country; he opposed it in the pulpit, and in the assemblies of the people, with a boldness and enthusiasm peculiar to his character; and, even under the rod of French tyranny, he had the courage, in 1797, publicly to expose the oppressive conduct of France towards Swisserland, in the "Words of a free Swiss to the Great Nation," which, however, was attended with no other consequence than merely to call forth an answer from the French ministry. When Massena, on the 26th September of the same year, reconquered Zurich, he generously exposed himself in endeavouring to avert the calamities which threatened the city from the unbridled fury of the soldiery; and, while supplying them with necessaries, and expostulating with them in the street, he was inhumanly shot in the side by a grenadier. From the effects of the wound he never recovered; and when unable to discharge his official duties, he employed himself in literary labours, and gave to the world two beautiful odes, entitled "Zurich at the close of the eighteenth, and at the commencement of the nineteenth century." After bearing his protracted sufferings with exemplary resignation, he expired in the 60th year of his age, in January 1801. The singular work of Lavater on Physiognomy was translated into English by the Rev. D. Hunter of London-wall, in the course of which we are told, in the Memoirs of the late William Smellie, that he actually travelled to Zurich in Switzerland for the express purpose of paying a visit to Lavater, whom he characterised as "a strange, wild, eccentric creature; possessing great genius, unaffected piety, unbounded benevolence, moderate learning, much caprice and unsteadiness, a mind aspiring by nature, and grovelling through necessity, with an endless turn to speculation and project;—in a word, a clever, flighty, good-natured, necessitous man."

LAVER, a sacred utensil, used in the Jewish tabernacle, for washing the hands and feet of the officiating priests, and the entrails of the victims.

LAVINGTON, a town in Wiltshire, 90 miles from London, with a population of about 900.

LAVOISIER, Anthony Lawrence, a distinguished chemist, was born at Paris, 1743. He devoted himself early to the study of natural science, and acquired a thorough knowledge of all its branches. When the French government, in 1764, offered a prize for the best mode of lighting the streets, he composed a treatise, which the academy caused to be printed, and which the king rewarded with a gold medal. Already, in 1768, he was elected member of the academy. The nature of the gases coming soon after to be an object of keen investigation, Lavoisier, who possessed means for making extensive experiments, entered warmly into the subject, and, in his *Opusculus Chymiques* 1774, gave a review of all that had hitherto been achieved, together with a detail of his own important experiments. Shortly afterwards he shewed (1778) that the gas discovered by Priestley, which he termed dephlogisticated air, and which Scheele thought was pure air, forms a constituent part of all the acids, to which he gave the name of oxygen. His experiments to form water by the burning of oxygen and hydrogen together, and conversely to resolve it again into these elements, was an important step towards the introduction of the new system of chemistry, the merit of which is chiefly to be ascribed to Lavoisier. It was completed by his theory of combustion and oxydation, his analysis of atmospheric air, and his doctrine of inflammability, which were fully exposed in his *Elemens de Chymie* 1789. The principles therein developed were adopted by all the enlightened chemists of Europe, and gave to the science a new form. The state did not fail to reap advantage from Lavoisier's genius, for he was in 1776 appointed by Turgot to superintend the manufacture of gunpowder, which he materially improved. As preparative to the introduction of the new system of weights and measures, he communicated the result of a series of accurate experiments on the expansion of metal. Agriculture early attracted his attention; and when, in 1791, a new system of taxation was to be introduced, he published a valuable pamphlet, entitled *Sur la Richesse territorial de la France*, which was only the outline of a great work for which he had long been collecting materials. After having been one of the administrators of the *Caisse d'escompte*, he was appointed, in 1791, one of the commissioners of the treasury, into which department he introduced the utmost order and regularity. The estimation in which he was held, as well as his riches, proved fatal to him under the cruel tyranny of Robespierre. He was accused, condemned, and executed on the 8th of May 1794. Lavoisier had the good fortune to be born at a period the most favourable for the exercise of his talents,—earlier he would have found the science of chemistry in too imperfect a state, at a later period he would in all probability have been anticipated by others.

LAW, Edmund, D. D. a native of Lancashire, was born in 1703, and educated at St John's college, Cambridge. During a long life, he was incessant in religious and metaphysical studies; and, amongst other works, wrote An Inquiry into the Ideas of Space, Time, &c. While fellow of Christ college, he presented to the world a Translation of Archbishop King's Essay on the Origin of Evil, with Notes, to which he prefixed a Preliminary Dissertation. He likewise prepared an edition of Stephen's *Thesaurus*, and a quarto one of the Works of Mr Locke, with a Life of the Author. He married about the year 1737, and was promoted in 1743 to the see of Carlisle, which he held for many years. He died in 1787.

Bishop Law appears to have been a great admirer of the writings of Mr Locke, upon which indeed he seems to have modelled his own principles. He was a man of great mildness of disposition, and evinced much zeal for religious liberty.

LAW, John, the noted financier, was the son of a goldsmith, and born at Edinburgh 1681. He distinguished himself early by his proficiency in calculation, and, while yet a youth, was employed by the ministry to bring the revenue accounts into order, which, previous to the union with England, were in a state of confusion. In order to supply the deficiency of specie, he proposed to erect a bank which should issue paper-money to the amount of the whole landed property of the kingdom. His scheme was of course rejected; but he does not appear to have thereby lost his good opinion of its merit, and it continued to form the basis of all his future projects. Disposed to live in higher style than his limited property could sustain, he engaged deeply in gambling to supply the deficiency; and in this he contrived to make his powers of reckoning of essential service. Having killed his antagonist in a duel, he repaired to Italy, where he gave full scope to his gambling propensities; and, after being expelled from Venice and Genoa as a sharper, finished by proposing his finance scheme to the duke of Savoy, by whom it was rejected. A like result awaited his overtures to the ministry of Louis XIV.; but in consequence of the disorder which had crept into the systems of finance under the regency of the duke of Orleans, he succeeded in gaining a favourable hearing. His first undertaking (1716) was the erection of a bank with 1200 shares, each of 3009 livres, which, by its punctuality, acquired such unlimited credit, that its paper was preferred to specie. In a short time, it became the office for transacting all the pecuniary business of the state. Soon after, Law contrived to unite with it a Missisippi company for the distribution of lands in Louisiana, from the produce of which, as well as from the expected commercial intercourse, immoderate gains were anticipated. In 1718 it was declared a royal bank, and, by a number of arbitrary concessions, acquired such prosperity and confidence, that its shares arose to twenty times their original value. From every part of France money and valuables were poured into the bank, every one considering his fortune to be made, as soon as he had secured a share in its capital. Law was regarded as the Plutus of the kingdom; and having, in 1720, gone over to the catholic religion, was appointed comptroller of finances. Meanwhile the bubble began to burst. In vain did the regent banish the Parliament of Paris for daring to interfere; Law's credit was not to be upheld. After five months administration he was obliged to resign his office, and at last to secure his personal safety by leaving the kingdom, loaded with universal imprecations. He lived afterwards in obscurity on the remains of his once splendid fortune, and died at Venice 1729, to the last occupied with great plans, and fully convinced of the excellence of his scheme, the failure of which in France he ascribed solely to the intrigues of his enemies.

LAW.

I. *On the Nature of Law in General.*

WHATEVER carries along with it a necessity, is called a *law.* If the necessity lies in the nature of material powers, the law is denominated a *physical law;* and, inasmuch as it determines to action the dispositions of an animated being, it is called a *law of instinct*, or, in the frequent language of the Roman civilians, *jus naturale.* If the necessity, on the other hand, resides in the higher faculties of mind, it forms an *intellectual law*, and, in particular, is denominated a *moral law* when it reposes on the dictates of what, by some philosophers, has been called practical reason, by others the moral sense. A systematic complement of the laws of this last description, constitutes the *science of jurisprudence in its more extensive signification.*

Abstracted from moral law, the will of man is altogether unrestrained; whereas, by moral duty, a necessity is imposed upon the *subject* to act or not act,—a necessity which, in this respect, is denominated an *obligation.* If the free will of the obligated subject be so greatly constrained that it is unable to withstand the physical forces of another subject compelling the fulfilment of the obligation, the obligation is in that case denominated *perfect*, or *compulsory*; while, on the contrary, every other is stiled an imperfect or *moral obligation*, or *duty of conscience, or of benevolence.* From a compulsory obligation, there springs, for the subject in whose favour the free will of another subject is restrained, the *moral possibility* of requiring the actual restraint on the natural liberty of that other person, to the full extent of the obligation. This moral possibility is named a *right (jus,)* and in as much as it can actually be enforced *a compulsory right.* A system of law affording the foundation of compulsory rights, constitutes the *science of jurisprudence in its more limited signification.*

He who is not obliged, lives in a state of absolute liberty. A *right* can only be ascribed to him in as much as he is entitled to arrogate something exclusively to himself, and to impede others in the exercise of certain actions. Every right, therefore, supposes a conclusive obligation, but every obligation does not convertibly generate a right, which is exclusively the result of a compulsory obligation. Consequently, the rule, *jus et obligatio sunt correlata*, is only true to a limited extent.

By society, a club is constituted in order to secure from its members the fulfilment of their obligations through external compulsion. No compulsion is consequently established by political society to secure the fulfilment of mere duties of conscience.

Conduct which does not contravene a law is called *justice.* If this consist in the fulfilment of the moral obligations, it is named *internal* or *attributive*; whereas, if it conform to the compulsory obligations, it is stiled *external* or *expletory* justice.

Command is always implied in the existence of a law; and no right can be conceived separated from an obligation in which an injunction is involved. Permission is only an indirect consequence of command. The division of laws into *permissive* and *coercive* is consequently false; but the distinction into *preceptive* and *prohibitory*, according as the law enjoins a positive or negative action, is on the contrary correct.

II. *On Laws in Relation to their Origin.*

1. *Natural law and its species.*—Considered in relation to their origin, laws are either *natural* (*jus naturae*, or, in the language of the Roman jurists, *jus gentium*, though sometimes they employed the term *jus naturale* in this signification,) when they are founded only on the conclusions of reason,—or *positive, civil, and municipal,* (*jus positivum, civile,*)

when they obtain their sanction and last obligatory force through an arbitrary fact of power. The former may be considered either as between individuals, and which in a peculiar sense is stiled the *law of nature*, or between people and people, and therefore denominated the *law of nations.* The latter may be either mixed or pure positive law, according as it does or does not adopt and satisfy the dictates of natural law. There hence arises three species of rights and obligations, *natural, civil,* and *mixed.* The first are comprehended under the term *obligation*, when used in the strictest sense of the word.

The positive legislator, in relation to those subject to his jurisdiction, can confirm, modify, or abrogate the obligations of natural law. If the civil law contains no alteration of the natural, the latter possesses, within the state, the full authority and operation of a positive enactment. If the contrary is the case, the natural obligation is either absolutely removed, or, in relation merely to its operation, conditionally restrained. There thus emerge three species of natural rights and obligations, the *effectual,* the *restricted,* and the *abolished.*

2. *Positive law and its species.*—Positive law cannot obtain authority in a state, without the consent of the ruling power; but it is not necessary that the ruling power should absolutely *prescribe,* for it can likewise *permit* that, out of certain facts, legal regulations should arise. Laws of the former kind are stiled *written* or *promulgated*; laws of the latter kind are called *unwritten, common,* or *consuetudinary.*

Positive written law is for those who believe in a supernatural revelation, either *divine* or *human.* The former may be either *particular,* which is intended only for a certain class of men, or *universal,* which is intended either to bind all men in *so far* as it shall be made known to them, or which has actually been promulgated to the whole human race. That the Old Testament was a law peculiar to the Jews, admits of little doubt; but greater controversy has arisen whether the Bible constitutes a code of the universal law of God, or is only obligatory upon Christians. The jurist, in this case, can only answer, that the Bible is not *de facto* universally published.—Whether in conformity to its scope it contains a code of general jusisprudence?—whether the judicial law of Moses is abrogated by the Christian dispensation? and whether the latter promulgates only moral precepts?—these are problems which the theology of each individual must answer to himself.

Positive laws of human origin are either *adoptive* or *indigenous.* To the former belong, in many of the countries of Europe, 1. The Roman law; 2. The Canon law; 3. The *Consuetudines feudorum*; but all under numerous modifications, and to a very various extent.

In reference to the doctrine of unwritten law, the first general principle is, that every one, in so far as he is not bound by written laws, can subject himself voluntarily to conventional laws, without requiring any general permission or particular approbation of the legislator; whereas, before any one can be subjected to laws neither constituted by the regent, nor imposed by the individual as obligatory on himself, this must be justified by evidence of a general permission, or of a particular approbation of the ruling power. Laws of the former kind may, for brevity, be stiled *conventional,* as distinguished from the latter or ordinary unwritten law.

To the latter species of unwritten law belong, *judicial custom,* (*decisions, res judicatæ.*) If, for example, a rule has been frequently and always consistently followed by any tribunal, *this* tribunal is bound to persist in following it in all similar cases, not only in regard to matters of formal regulation, but in regard to the subjects in dispute.

A similar legislative power is also seen in the *common* or *consuetudinary law,* (*jus consuetudinarium, consuetudo, mores majorum.*) If, for instance, the common opinion of a people, or of a certain class of persons, agrees in recognising a rule as obligatory, their purpose being validly framed from a long series of acts, and their understanding being openly evinced by an undeviating conformity to the rule, whether in acts of positive or negative custom; there springs from this declared community of opinion, a law for those who belong to this people or class of persons, in so far as this custom is applicable to points which the written law has left undetermined, (*consuetudo constitutiva.*) Customs in confliction with the written laws, (*correctoriae derogatoriae,*) when they are not specially recognised by the legislative sovereign, or have not been acted upon for a period beyond the memory of man, in the Roman jurisprudence, and in that of more countries of Europe, are of no avail, whether to the effect of abolishing the law by non-usage (*desuetudo,*) or by the introduction of a new principle contradictory of the law, (*c. abrogatoriae.*)

III. *Of the Obligatory Force of Laws.*

The binding power of positive laws can only commence with the moment in which the fact by which they are established is accomplished. Written laws are therefore first rendered obligatory by the promulgation.

When a positive law obtains its force, its effect extends only to future and not to past transactions, except in those extraordinary cases in which the legislative act is expressly in reference to the antecedent acts.

The force of written laws promulgated by the legislative authority of the state, extends over all within its territory, persons as well as things. Subjects of the state are thereby unconditionally obliged: foreigners, on the contrary, so long only as they remain within the bounds of the territory. In doubtful cases, moveable property is judged according to the law to which the proprietor is personally subject; even if the laws of the territory in which such property is situated be specially directed to it, still their operation must cease with its exportation beyond the limits of the jurisdiction.

IV. *On Laws in relation to their Comprehension.*

Considered in regard to their comprehension, laws are either, 1. *General,* which establish a universal rule; or, 2. *Special,* which are only valid in relation to particular cases and persons. The latter, again, are either, 1. Such as involve no exception from the general law; or, 2. Such as do contain such an exemption, in which case they are stiled *privileges.*

V. *On the Relation of Laws to each other.*

If we consider laws in their mutual relations, a question arises in regard to the preference to be conceded to them in the event of their confliction. The answer to this question is contained in the following rules: 1. Laws which are not mutually incompatible do not abrogate, but only restrict each other; 2. If there exist an irreconcilable contradiction, the more recent abrogates the more ancient.

VI. *Of the Endurance, Abolition, and Modification of Laws.*

A law does not of itself lose its force, if the season has not passed, and the conditions have not failed, in relation to which it was enacted; but it must lose its power through an act of the legislative authority. By such an act it is abolished even though originally sanctioned as perpetual.

Alterations of a law can occur in different ways, and this either by a total or a partial abolition. The former is called *abrogation,* and can be effected either by an absolute repeal or by the enactment of a contradictory regulation. The latter may be supposed either by a partial repeal (*derogation,*) or by an addition (*subrogation,*) or by the abolition of a part by the enactment of an opposing rule, (*abrogation.*)

The more recent law abolishes the more ancient. But while the latter can only be abolished when the contradiction is perfectly manifest, so the ambiguity of a new enactment is to be interpreted in that sense by which it is least placed in opposition to the existing law.

VII. *On the End of Laws.*

The end of laws is their application to those cases in relation to which they were established. To this belong a knowledge of the meaning of the laws, and of the transactions on which are founded rights and obligations.

1. *Interpretation of laws.*—When the document of a law is considered in regard to the meaning of its contents, this is called its *interpretation*; and a system of those rules, by which this interpretation ought to be conducted, is stiled the *art of juridical interpretation.* If the interpretation is performed by the legislative authority, it is called *legal,* in other cases it is stiled *doctrinal.* The former is again either *authentic* or *usual,* according as it is conversant about the sources of written or of unwritten laws. The validity of this interpretation does not depend on its intrinsic conformity to any canons of interpretation, but on the legislative authority of its author. The following principles are exclusively applicable to the doctrinal interpretation.

In every law we must distinguish from each other, what, in conformity to the ordinary usage of language, is indicated by its words,—what the power of the law has actually wished to express,—and the result which is afforded by a consistent conclusion from the foundations of the law itself. If we follow in our interpretation the analogy of ordinary language, our interpretation is called the *grammatical;* if, on the other hand, we regard the *spirit* of *the law,* that is, the intention of the legislature and the foundation of the law, this is termed the *logical interpretation.*

The interpreter must first look to the words, and then only employ the logical interpretation when its necessity is strongly evinced. When he adheres in his grammatical interpretation to the simple meaning of the words, this is called the *verbal* or *literal* interpretation. In this verbal interpretation, according as the more extensive or more limited signification of the terms is adopted, it is usually called the *broad* or the *strict* interpretation; although the latter expression is sometimes used to express the verbal interpretation in general, as contradistinguished from the logical.

Among several given meanings, the grammatical interpreter must, in doubtful cases, prefer the more ordinary and popular, when the legislator cannot be shewn to have adopted a peculiar form of expression. When the signification of terms has been varied by time, that meaning is to be preferred which was more usual at the date of the enactment of the law. Laws really ambiguous can only be expounded by the grammatical interpreter, to the extent of developing the double signification of the language; the choice between the several meanings remains to the logical interpretation.

The logical interpretation may be opposed in its result to the grammatical, or it may not. In the latter case, it may be in conformity with manifest expressions, or it may determine ambiguities. In the second alternative, it was denominated by the ancients *interpretatio declarativa.* In the former case, the logical result may either be wholly adverse to the grammatical interpretation, or it may only modify its conclusions. On the second supposition, the application of the law may be either extended to a multitude of cases, or it may be limited to a few. The former is stiled the *extensive interpretation,* the latter the *restrictive.* The extensive, restrictive, and declarative interpretations, do not exhaust all the conceivable modes of logical interpretation; but there is only required a developement of the principles which are in force relative to these three species, as by a very easy process they may be rendered applicable to all the others.

In relation to the extensive construction, in as much as we conclude, from the *foundation of the law,* it is a primary rule, that when, in an omitted case, the same reason occurs in consideration of which the legislative rule was in other instances enacted, that this rule should likewise be held applicable to the omitted case, even when the law is consuetudinary. Even correctory laws, in so far as their extension does not interfere with the positive law which is left unchanged, are to be interpreted to the same effect, but not privileges, particular rights, or laws whose extension is forbidden. If, on the contrary, we regard the intention of the legislator, every law is to be extended in conformity with his views. The extensive interpretation is in general denominated the *analogical*.

In reference to the restrictive interpretation, the common rule, *cessante ratione legis, cessat lex ipsa*, is altogether false. For though, in the course of time, the original ground of the law should fail, it still remains valid; and is not to be restrained merely because there occur individual cases to which the principle of the law does not apply. The logical restriction of a law is only then allowed when it can be shewn, that the *intention* of the legislature did not contemplate the application of the enactment to these cases.

Finally, in regard to the declarative interpretation, we must first endeavour to investigate the principle of the law, and the *special* intention of the law-giver, and then bestow the preference on that result which is deduced from this investigation. If we are unable to arrive at any determinate conclusion by this proceeding, we must act upon the rules that it is the general intention of the legislature; 1. That the verbal signification best adapted to the nature of things be preferred; 2. That in correctory laws and privileges, the stricter, that is, the meaning least distant from the established law, be adopted; and, 3. That the judge, in the absence of all other principles, should follow the mildest and most equitable declaration.

2. *Interpretation of legal transactions.*—In relation to the doctrine of the interpretation of legal transactions, the Roman law contains an infinite number of rules, which, as founded on the correctest principles of justice, have been almost universally adopted into the different systems of modern jurisprudence. Almost all the laws in regard to contracts, servitudes, and legacies deserve no other designation. For a general view, it may be sufficient to abstract the following leading principles: 1. In conformity to the rules already stated in reference to the grammatical interpretation of laws, we must look to the signification of the words, and to the meaning generally attached to them at the place and time of the transaction. General words unconditionally employed are to be interpreted to this extent; and no word is to be treated as superfluous, even although the whole transaction should by a plain interpretation be overturned. Where, however, there occur indefinite and ambiguous expressions, that sense is to be adopted through which the transaction is maintained, or though which the result most fully in unison with the nature of the transaction is obtained; finally, that meaning is to be preferred which is least detrimental to the losing party. 2. The words immediately determine the nature of the transaction; but if an opposite intention can be found, the result of that proof is to be preferred. A distinction, however, arises according to the different relations of the transacting parties. In bilateral transactions, when the words are clear, no regard can be paid to the intention of one of the parties. If the intention of both parties are in unison, this is to be preferred to the clearest language. The preamble, or introductory clause, is in general the great mean of discovering the intention of the contracting parties. In unilateral transactions, the intention of the speaker must determine; and when his language is ambiguous, it must be construed in conformity to its preliminary declaration. If the transaction (as in the case of a testament) is of such a kind that it cannot be effected without the will, but not by an unexpressed will, the proof of an intention contradictory of the words causes the abolition of the verbal contents, but not the establishment of a new and unexpressed precept. If it is impossible to obtain a certain result by any of the abovementioned methods, the transaction must be considered to be null.

LAWN, an open space of ground, usually in front of a mansionhouse, laid out according to the principles of taste, and having the boundaries shaded with trees. For this purpose, the best adapted are the elm, oak, chesnut, and beech, with which also should be intermixed, for additional ornament, a suitable variety of evergreens. The lawn should be as extensive as possible, and so contrived in point of figure as to suit the adjacent ground.

Lawn is also a kind of linen, commonly used for the sleeves of bishops.

LAWRENCE, St. a river of North America, which flows out of lake Ontario, and, after a course of 700 miles, empties itself into the North Atlantic ocean. It is navigable for large ships as far as Quebec, and vessels from Europe ascend to Montreal, 180 miles farther. In its course from lake Ontario to Montreal, it bears the name of Iroquois, and then taking a north-east direction it receives Ottawas from the westward, and takes the name of St Lawrence. The mouth of this river is 90 miles wide. Its nominal consequence would be considerably augmented by tracing the source of this fine river so far as lake Superior, or even lake Winipec.

LAWSONIA, Egyptian privet, a genus of plants belonging to the Octandria class.

LAWYER, a counsellor, or person learned in the law. See Attorney.

LAY, or Lai, a kind of ancient poem amongst the French lyric poets, consisting of very short verses, and adapted to melancholy subjects.

LAY-BROTHERS, among Roman catholics, are humble illiterate individuals, devoted to the service of their religious superiors by a vow of constancy and obedience, in like manner as the lay-sisters are in the nunneries.

LAYBACH, the capital of Carniola in Germany, situated on a river of the same name, is the see of a bishop, and contains about 500 houses, besides churches.

LAYERS are tender twigs of trees buried in the ground till they strike root, when they are separated from the parent tree, and become distinct plants. See GARDENING.

LAZARETTO, or LAZAR-HOUSE, (from the Italian,) a kind of hospital for the poor, and such as are affected with contagious diseases. They are allotted for the use of those who are obliged to perform quarantine.

LEACHLADE. See LECHLADE.

LEAD. See *Chemistry*, and *Mineralogy* under GEOLOGY.

LEADHILLS, in Lanarkshire, the highest inhabited village in Scotland. See LANARKSHIRE.

LEAF. See BOTANY.

LEAGUE, a measure of length, varying according to the usages of different countries. A league at sea extends three miles, and a nautical league is equal to three nautical miles.

LEAGUE is a mutual agreement between princes or states, for the purposes of aggression or defence. *The League*, also, by way of distinction, sometimes signifies that noted confederacy in France which lasted from 1576 to 1593, and which prevented the succession of Henry IV. to the crown till he had abjured the reformed religion.

LEAK denotes a chink or opening in a ship, through which the water forces its way, when the vessel is said to *spring a leak.* It is often stopped by applying a plug wrapped in oakum and well tarred, or by nailing on the place a piece of sheet-lead. A leak has been sometimes stopped by thrusting a piece of salt-beef into the opening.

LEAKAGE, in commerce, is an allowance of 12 per cent. in the customs, given to the importers of wine, for supposed waste in the passage. Three barrels in thirty-six are also allowed to brewers by the excise.

LEAP-YEAR, or BISSEXTILE, denotes a year of 366 days. To find if a given year be leap-year, divide it by 4, and if nothing remain it is leap-year; but if 1, 2, or 3 remain, it is so many years past leap-year. See *Chronology*, under HISTORY.

LEASE, in law, is a demise or letting of lands, tenements, or hereditaments, at a certain rent for life, or a term of years, or at will. See AGRICULTURE.

LEASE, and RELEASE, in the English law, is a species of conveyance.

LEASH, among sportsmen, signifies three of any species of animals, but chiefly greyhounds, foxes, bucks, and hares. The term also denotes a line for leading a hunting dog, and a thong of leather by which a falconer holds his hawk.

LEATHER, the skin of different beasts prepared by a chemical process for the use of mechanics and manufactures. See TANNING.

LEATHERHEAD, a market town of Surrey, 19 miles south from London. It is chiefly remarkable for a large annual fair. The vicinity is very picturesque.

LEAVEN, a piece of sour dough, used for the purpose of fermenting bread or paste. (See BREAD.) By the law of Moses, leaven was forbidden during the Passover; and the Jews, taught to regard it from the vigil of the feast as unclean, with characteristic scrupulosity purified their houses from its contaminating influence.

LEBADEA, an ancient town of Bœotia, between Helicon and Chæronea. Here stood the oracle of Jupiter Trophonius. Before consulting it, the votary had to descend into a subterraneous gulf. Lebadea contains about 1500 houses, and carries on a considerable commerce.

LEBANON, LEBANUS, a remarkable mountain of Asia, on the borders of Palestine and Syria. The name Lebanon applies to the western ridges, and Anti-Lebanon to the eastern, comprehending between them the province of Cœlo-Syria. This mountain is about 100 leagues in compass, consisting of four ridges rising one above the other. Of the boasted cedars of Lebanon almost none remain, and that place is now chiefly occupied by a degenerate race of firs, oaks, mulberry-trees, fig-trees, and vines. Several rivers have their source in this mountain. The chief inhabitants are the Maronites and wild Arabs, and the place is now a noted haunt of robbers.

LECHLADE, a town of Gloucestershire in England, situated at the confluence of the river Lech with the Thames. It has a weekly market and an annual fair. The church is a handsome edifice, and was erected in the 15th century.

LECTURERS, in England, a certain class of men employed by the vestry to preach in parish churches, distinct from the rector, vicar, and curate. They are commonly the afternoon preachers in the Sunday service.

LEDBURY, a manufacturing town of Herefordshire in England. See HEREFORDSHIRE.

LEE, a sea term, denoting that part which the wind blows upon, or is opposite to the wind, as the lee-shore. To be under the lee of the shore is to be close under the weather shore, or under the wind. To lay a ship by the lee, is to bring her so that all her sails may be flat against the masts and shrouds, and the wind to come right on the broadside.

LEEWAY denotes the deviation of a ship's real from her apparent course, caused by contrary winds and the roughness of the sea.

LEECH, HIRUDO. See HELMINTHOLOGY.

LEECHES, or LEETCHES, in a ship, are the outward edges of a sail, and the leech-lines are small ropes fastened to the leech of the top-sails to haul it in. The leeches of such sails as have their tops and bottoms parallel to the deck, or at right angles to the mast, receive their appellations from the ship's side and the sail to which they belong; as the star-board leech of the main-sail, the lee-leech of the fore-top-sail, &c.

LEEDS, a flourishing town situated on the river Aire in the west-riding of Yorkshire, is about a mile and a half in length, and contains many handsome buildings, among which are several churches and public halls, an infirmary, the new court-house and prison, the assembly-rooms, and theatre. The population in 1811 was 62,500. The manufacture of woollen stuffs is very considerable, particularly coarse cloths; besides which, carpet manufactories, cotton-mills, and potteries, are established. A market is kept for coloured cloths every Monday and Saturday. Leeds was incorporated by Charles I. with a chief alderman, nine burgesses, and twenty assistants; and by Charles II. with a mayor, twelve alderman, and twenty-four assistants.

LEEK, Allium. See Botany and Gardening.

LEER, a furnace for annealing and cooling glass vessels. See Glass Manufacture.

Leer, a term among hunters to denote the lair or place where the deer lies to dry himself when wet with the dew. To leer is to cast a witching or cunning look.

LEES, the dregs of wine, or the grossest part of liquors, which, separated by fermentation, falls to the bottom. The lees of wine, dried and made into cakes, becomes an object of trade.

LEET, or Court-Leet, is a court of jurisdiction, belonging to the lord of a manor, for punishing offence against the crown, and is said to be the most ancient of the kingdom. It is held within a particular hundred, lordship, or manor, before the steward of the leet, for the preservation of the peace, and for the chastisement of divers minute offences against the public good.

LEEWARD ISLANDS, so named from their situation in a voyage from the ports of Spain, and in contra-distinction to the Windward islands.

LEG. See Anatomy.

Leg, in Trigonometry, the side of a triangle. In sea affairs, a small rope belonging to the martnets.

LEGACY, a gift bequeathed by a testator in his will, to any private person, or to a corporation. Should the funds of the testator prove inadequate to the payment of his debts, all the pecuniary legacies must abate in proportion; but a specific legacy does not abate, unless there should be a deficiency without it. Should the legatee predecease the testator, it is termed a lapsed legacy, and returns to the general fund; but if it can be ascertained, from the general tenor of the will, that the testator intended such to be a vested legacy, it will belong to the representative of the deceased legatee. If a testator leaves a legacy payable when the legatee arrives at a certain age, and if the legatee survive the testator, but die before the legacy is payable, such legacy will be vested in his representative *a morte testatoris.* In the case of a vested legacy charged on land or money in the funds, interest becomes payable from the death of the testator; but if charged on his personal estate only, the interest runs only from the end of the year after the testator's decease.

LEGATE, Legatus, a cardinal or bishop sent by the Pope as an ambassador to sovereign princes. Legates are of three kinds, the most considerable of which are the legates *a latere,* and the next the legates *de latere.* Court of the legate was a court granted by Pope Leo X. in the reign of Henry VIII. by Cardinal Wolsey, in which he became the Pope's legate, and had power to prove wills and dispense with offences against the laws of the church; but it speedily fell into disuse.

LEGATEE, in Scotch law, the person who receives a legacy.

LEGEND, a book formerly used at divine service in the Romish churches, in which are recorded the lives and history of the saints and martyrs, portions of which were read out at matins; but as many ridiculous stories were told by the Romanists of their saints and others, in order to support the credit of their religion, this term is now applied to denote any ridiculous story or idle tale. The term likewise denotes those letters or inscriptions which are formed on the margin of coins, or impressed on medals. Strictly speaking, however, the inscription differs from the legend, the former signifying the words on the reverse, in place of figures. Medals being intended to answer the double purpose of emblems and images, the one designed for the learned, and the other for the unlearned, images denote the countenances of princes, and the emblems denote their virtues and exploits; the legend representing the soul, and the figures the body. Medals have two legends, one to represent the name, offices, and titles, and the other the illustrious actions and noble mind. They are designed to perpetuate the names, and keep in remembrance the virtues of princes and great events. The legend is the name of the province or city, and the reverse is the symbol, either with or without a legend.

LEGER. See Book-keeping.

LEGER-LINE in music. See Music.

LEGERDEMAIN, a title given to certain deceptive or slight-of-hand performances. See Magic.

LEGHORN, a fortified city of Tuscany in Italy, regularly built, and styled New Venice, on account of the number of its canals. Near the harbour, which is a very superior one, there is a light-house on an island. The trade in foreign produce is considerable. This city contains 50,000 inhabitants, and is the see of a bishop. The Jews have a synagogue, and the Greeks and Armenians have their churches, no religion being disturbed. This city suffered by an earthquake in 1741. It was entered by the French in 1796, and evacuated by them in 1799.

LEGION, a division of the Roman army, varying in strength at different periods of the Commonwealth. Under Romulus, 1000 foot and 100 horse were selected from each of the three tribes, forming a legion of 3300 men. In the time of Polybius, a legion consisted of 4200; while under the emperors it amounted to 6100 infantry, and 726 cavalry, with an equal number of auxiliaries, forming a body, when complete, of about 12,500, according to Gibbon's computation, though, in the opinion of other writers, it fell considerably short of that number. Each legion was divided into 10 cohorts and 55 companies, under the orders of a corresponding number of tribunes and centurions. The standard was a silver eagle, which, as a mark of honour, was entrusted to the custody of the first cohort, consisting of 1105 chosen men, while the remaining nine contained each only 555. In the time of Augustus, the Roman army was composed of 25, and the peace establishment of Hadrian of no fewer than 30 legions.

LEGISLATOR, one who frames laws for a state or kingdom.

LEGITIME, in Scotch law, that share of moveable effects belonging to a husband and wife which falls to the children upon the father's death.

LEGUME, Legumen, a species of seed-vessel. See Botany.

LEGUMINOUS, a term for plants whose seed is a legume.

LEIBNITZ, Gottfried Wilhelm, one of the most distinguished men of which Germany can boast, was born 4th July 1646, at Leipzig, where his father was professor of morals. When a boy, he gave indications of splendid talents, which he cultivated with uncommon perseverance. The study of mathematics engrossed nearly his whole attention at the time he entered the university, when afterwards he extended the course of his studies by a careful perusal of the Greek philosophers. On taking the degrees of bachelor and master of arts, he acquired great celebrity; but having met with a repulse from the dean of faculty, on wishing to become doctor at the age of twenty, he went to Altdorf, where he obtained his degree with great honour. Induced by the fame of a society of alchymists, he went from thence to Nuremberg, and there became acquainted with Baron Von Boinaburg, minister to the elector of Mayence, who introduced Leibnitz into the service of his prince, and afterwards sent him on a mission to Paris, where he acquired the friendship of Lahire, Cassini, Huygens, Malebranche, and other eminent men. In 1673, the loss of his master and patron induced him to undertake a journey to England, which added greatly to his improvement by a friendly intercourse with Wallis, Boyle, and Oldenburg, and led him into a correspondence with Sir Isaac Newton. After a stay of four years, he returned again to Germany, with an increase of knowledge and observation, and was appointed counsellor and librarian to the Duke of Brunswick-Lunenburg. In 1684, he opened a new field to the inquirer, by the discovery of the differential calculus, which, by this time, had also been effected by Newton, but not made public. The merit of the discovery, however, became afterwards a subject of keen dispute, and Leibnitz was openly accused of having surreptitiously appropriated the discoveries of Newton. The university of Gottingen, at a late period, instituted an inquiry into the matter, the result of which was, that, in consequence of the state of science at the time, the merit of the discovery might be fairly claimed by both. He was equally ardent in the prosecution of metaphysics, in which his disquisitions on the doctrine of innate ideas, his theory of atoms, and particularly his attempt to reconcile the existence of moral evil with the goodness of God, are highly deserving of commendation. It was a primary object with Leibnitz to bring about the establishment of institutions for the advancement of knowledge; and the academy of Sciences at Berlin, of which he was made president, owed its origin to his recommendation. Still more advantageous was his conference with the Czar at Torgau, in 1711, concerning the encouragement of the arts and sciences in Russia. He was made privy-counsellor, with a pension of 1000 rubles, and soon after had the honour to be appointed aulic counsellor to the Emperor Charles VI., when he was also raised to the rank of baron. He ended an active life, spent in the pursuit of science and literature, on the 14th November 1716, in the seventieth year of his age. One of his favourite ideas was the invention of an universal language, (*Pasigraphie*) which might facilitate the intercourse of the learned, and become the vehicle of science. At this scheme he laboured during the greater part of his life, without being able to arrive at any decisive result. The fragments which he left behind him on this subject were given to the world, and excited much discussion among philosophers, which ended, however, in the general conviction of the impracticabilty of his gigantic scheme.

LEICESTERSHIRE, a county nearly in the centre of England, bounded on the east by Rutland and Lincolnshire, on the north by Nottingham and Derbyshire, on the west by Warwickshire, and on the south by Northamptonshire; extends about 38 miles in length, and as far in breadth at the broadest part; and contains an area of 560,000 acres. It is divided into six hundreds, and the population is about 200,000. The soil affords rich grazing land, and is very fertile in the production of beans. The Bardon-hills, in the vicinity of Charnwood forest, rise to a great height. This county contains some valuable coal mines, and is remarkable for the breed of black horses, horned cattle, and sheep. The principal rivers are the Welland, the Soar, and the Avon. Stocking-weaving, patent-net lace, wool-combing, and Stilton cheese, are the chief branches of manufacture. The county sends four members to Parliament.

Leicester, the county town, is seated on the river Soar, and is remarkable for some remains of antiquity. It contains five churches, and has a spacious market place. The combing of wool, and manufacture of stockings, afford employment to the inhabitants. Here was made the first law for the burning of heretics, in the reign of Henry V. Near this town is an abbey, now in ruins, in which the great and unfortunate Cardinal Wolsey died. It gives the title of Earl to several noble families.

LEIGHTON, Robert, was archbishop of Glasgow during Cromwell's usurpation. For a period of ten years he presided over the university of Edinburgh, where he exhibited all the talents of a learned and prudent governor. He was afterwards consecrated bishop of Dunblane. In his own diocese he set an example of the utmost moderation and most unbounded charity; and that he might have no share in those oppressive measures that were pursued by his brethren, he resigned his bishopric. Being a person of a most amiable disposition and strictest integrity, he was greatly esteemed. He left many sermons and useful tracts, and died in 1684.

LEINSTER, a province of Ireland, bounded on the east and south by St George's channel, on the west by Connaught, and on the north by Ulster, is 112 miles long, and 70 broad, and contains the following counties: Carlow, Dublin, Kildare, Kilkenny, King's county, Longford, Lough, East Meath, Queen's county, West Meath, Wexford, and Wicklow. The capital is Dublin.

This province is the best cultivated in the kingdom; the air is healthful, and the soil productive. The Burrow, Boyne, Liffey, Neur, Urtin or Slane, May, and Inny, are the principal rivers.

LEIPZIG, one of the most important and celebrated cities of Germany, is situated in the dominions of the king of Saxony. It has long been the emporium of internal commerce, by means of its fairs, held annually at Easter, Michaelmas, and New-Year. Of these, the two first are the principal, and are frequented by an immense number of strangers from every country in Europe, either for the sale or the purchase of all kinds of manufactured goods and natural productions. Owing to political and other causes, the attendance on these fairs has of late been less frequent, and the business done consequently not so productive, especially to the British merchant. They continue generally from three weeks to a month. Leipzig is in particular the magazine of German literature, where almost every work of importance is printed, and where the principal publishers of other places have warehouses for the supply of the trade. It is equally celebrated as a seat of learning, and its university is the oldest in Germany, next to that of Prague, from which, in consequence of disturbances, both professors and students emigrated, in 1409, to settle here. Civil law, history, and particularly philology, are here cultivated with great ardour and success. There are many professors of eminence, and in the latter department the extraordinary merits of Herrmann are now well known, at least in England. There are upwards of 1000 students, about 500 of whom are assisted by public endowments, in which the university is very rich. The streets are spacious, and the houses lofty and well built. The city and suburbs are said to contain 36,000 inhabitants, a population more than proportionate to its limited extent; and it arises perhaps from this cause that the mortality in Leipzig is greater than in other towns equally populous. The ancient fortifications have been converted into public walks, planted with shady trees, and disposed with great art and neatness. There is an excellent theatre, a regular succession of concerts and assemblies in winter; and in summer there are a great many public gardens in the vicinity, where all ranks can enjoy the most agreeable relaxation, while the general diffusion of wealth and intelligence renders the social intercourse both interesting and instructive to the stranger. Leipzig derives great additional celebrity from having been the scene of some of the greatest exploits in modern history. In the 30 years war, it was distinguished by the decisive victory obtained, on the 7th September 1631, by Gustavus Adolphus over the Austrian General Tilly, till then reputed invincible, and still more by the memorable events of the 16th, 18th, and 19th of October 1813. The meeting of the allied sovereigns, and their generals, in the market-place, at noon, on the 19th of October 1813, to congratulate each other on their glorious but hard-earned victory, affords a subject of proud recollection to its inhabitants, though it was too dearly purchased by the famine, pestilence, and disease which naturally followed the war. No traces of devastation, however, now remain, and the city wears the aspect of prosperity and peace.

LEITH. See EDINBURGH.

LEITRIM, a county in the province of Connaught in Ireland, bounded on the north by Donegal bay, on the north-east by Fermanagh and Cavan, on the south-east by Longford, and on the west by Roscommon and Sligo, is about 42 miles long and 17 broad. It is mountainous to the northward, but towards the south, which is level, the soil is well cultivated. The river Shannon issues from lough Allen; besides which there are a number of lakes and rivulets. The county consists of seventeen parishes, and sends two members to Parliament. It abounds with iron ore, copper, limestone, and lead.

Carrick is the capital of the county. It is seated on the Shannon; but has little or no trade.

LEITRIM, formerly a place of some note, has a linen manufactory, and is also seated on the Shannon.

LELAND, JOHN, an eminent English antiquary, a native of London, born about 1507. In early life he was placed in St Paul's school, from which he was sent to Christ's college, Cambridge, and some years afterwards was removed to Oxford. He afterwards went to Paris to study Greek; and having returned to England, he took orders, and was first appointed chaplain to Henry VIII. who gave him the rectory of Poppeling, and likewise the office of king's antiquary, in 1533. By this commission he was authorised to examine all the ancient writings in the public libraries throughout his majesty's dominions. Having appointed a curate at Poppeling to supply his place, he examined all the monuments of antiquity in England, and in this employment he spent six years. Besides the rich rectory of Haseley, in Oxfordshire, he was appointed to several additional livings, and was thus enabled to retire to a house of his own in London, where he arranged the materials he had bestowed so much pains in collecting. Soon after the death of Henry VIII. Leland was seized with a deep melancholy, which totally deprived him of his reason; and from this unhappy condition he was released by death in the year 1552. He was eminent as a man of learning, was an universal linguist, and a skilful antiquary. Several of his MSS. sometime afterwards fell into the hands of Sir John Cotton, and were found to be of great use to subsequent antiquarians. His Itinerary through England and Wales was published in nine volumes 8vo in 1711, and his *Collectanea* in 1715.

LELAND, JOHN, an eminent divine, was born in 1691, at Wigan in Lancashire. In his sixth year he lost the use of his memory and understanding by the small-pox, and continued in this deplorable state nearly a twelvemonth, when they were happily restored to him in all their vigour. His parents having settled in Dublin, he thus obtained the advantage of an excellent education, and in time became pastor of a congregation of Protestant dissenters in that city. To the many attacks made on Christianity at that period, he published the most powerful and convincing answers; and being completely master of this controversy, he compiled a history of it, styled, "A View of the Deistical Writers that have appeared in England in the last and present century," &c.—a work of great excellence, and which has been deservedly esteemed. Besides this, he published another laborious work, under the title of "The Advantage and Necessity of the Christian Revelation, shewn from the state of Religion in the ancient Heathen World, a Rule of Moral Duty, and a State of Future Rewards and Punishments, with a Discourse on Natural and Revealed Religion."

Not only his writings, but his exemplary life recommended his memory to general esteem. He died 1766.

LEMBERG, the capital of Gallicia, is a large town on the Pettew, a branch of the Berg, and the seat of the Austrian governor and of the courts of justice. In 1803 the number of inhabitants amounted to 44,655, fully one-third being Jews. It had formerly a university, which was transferred to Cracow, but again restored in 1817. After Brody, it is the most important commercial town in the province, and has, among others, a flourishing manufactory which produces Nanquins and cotton cloth of all kinds, with a dye-work attached for Turkey yarn, and gives employment to above 1000 workmen.

LEMMA, in mathematics, denotes what is assumed in order to render the demonstration less perplexed.

LEMNA, DUCK-MEAT, a genus of plants belonging to the Diandria class. Of this species there are three natives of Britain.

LEMNOS, or STALIMENE, an island of the Archipelago, about 15 miles long and 11 broad; is mountainous, but productive of various fruits; and is subject to the Turks. The capital is the see of a Greek archbishop. This island was consecrated to Vulcan, and celebrated for its labyrinth. It is also famous for a kind of earth called *terra sigillata*, which is held in estimation by the Greeks for its virtue in consolidating wounds.

LEMON, CITRUS, is a genus of trees with large stiff leaves, and a flower expanding in form of a rose. The fruit is of an oval form.

LEMONADE. See DIETETICS.

LEMUR, a genus of quadrupeds. See MAMMALIA.

LEMURES, a name given by the ancients to restless ghosts, who were supposed to return and frighten the good or plague the bad; hence *lemuria*, or feasts to appease the manes of the dead, were observed at Rome.

LENA, a river of Siberia, rises to the west of the lake Baikal, traverses a large extent of country, and divides itself into five branches, which are discharged into the Frozen ocean. In its course it receives 16 rivers.

LENOX. See DUMBARTONSHIRE.

LENS, a piece of glass or other transparent substance, so formed that the rays of light passing through it have their direction changed. See OPTICS.

LENT, a solemn fast in the Romish church, in commemoration of our Saviour's fasting in the desert, and preparative also to the feast of Easter. Some suppose that Lent was always a fast of forty days, while others maintain that it was variously observed in different churches, and that, from a fast of forty hours, it became one of forty days. The ancient observance of Lent consisted in abstaining from food till evening. Besides that, before Easter, the Greek church observed four other lents, but these extended to only seven days.

LEO, the fifth of the twelve signs of the Zodiac. See ASTRONOMY.

LEO X. born at Florence 1475, was the second son of Lorenzo of Medici, and surnamed Giovanni. He was destined to the church from childhood, received the tonsure in his seventh year, and from that time was loaded with benefices. His father, ambitious to see a branch of his family on the papal throne, exerted himself to procure for him a cardinal's hat, which was effected through Innocent VIII. and given to him at the age of thirteen, on condition that he should study theology three years at Pisa, previously to his formal investiture. No means had hitherto been spared for his instruction and improvement, by which he did not fail to profit, and he made great progress under his masters, in all branches of polite learning. In 1492, he was accordingly admitted to a seat in the sacred college, and fixed his residence at Rome. In 1499 he visited the states of Venice, Germany, and France, and, after spending some time in Genoa, returned again to Rome, where he addicted himself to the pleasures of refined society and elegant literature. After having filled various public employments, he was unexpectedly elected pope on the death of Julius II. in the 38th year of his age; his elevation to the purple having been occasioned by his bad state of health, brought on by his own irregularities, it being at that time supposed he could not survive a few weeks longer. He shewed his taste for literature, by immediately appointing Bembo and Sadolet, two of the most elegant writers of his time, papal secretaries. The states of Italy were then notorious for fickle policy and want of faith, which Leo did not fail to sanction by his example, both in domestic politics and in the part which he took in the struggles between France and the empire. A taste for magnificence and shew, as well as a liberal patronage of the arts and sciences, had exhausted the papal treasury, which he sought to replenish by issuing indulgencies. These were publicly sold throughout the whole of Christendom, and the scandal greatly aggravated by the conduct of the itinerant monks who were engaged in conducting the traffic. Against this crying evil, Luther, with a daring peculiar to his character, raised his voice aloud; and to this abuse, which had its origin in Leo's extravagance, may be ascribed the immediate cause of the Reformation. Leo, on being informed of what was going forward, treated it at first with indifference; but, on farther remonstrances, he issued the famous bull 1520, in which he strenuously asserted the authority of the pope to grant indulgencies, and denounced anathemas against the reformer, who, on his part, appealed to a general council. While discord thus reigned in the church, his attention was directed to a favourite plan for inducing the powers of Christendom to undertake a crusade against Selim, emperor of the Turks; but their mutual jealousies prevented its being adopted. Although the Reformation still continued to advance, Leo was chiefly occupied in gratifying his taste for magnificent spectacles, in encouraging the arts, and in aggrandizing his family. To support his tottering power, Leo conferred on Henry VIII. of England, the title of "Defender of the Faith;" but in consequence of the pontiff's wavering conduct respecting Henry's divorce from his queen, his majesty abandoned the control of Rome, and espoused the cause of Luther and the Reformation. Leo, although much devoted to indolence, was nevertheless extremely ambitious, and made several other attempts at that time to extend the dominion of the church; and having made a treaty with the emperor for the restoration of the family of Sforza in Milan, a new war was begun, which terminated in favour of the allies. While preparing to celebrate these successes, with great pomp, at Rome, he was surprised by death, on the 1st of December 1521.

LEO, one of the most distinguished musical composers which Italy has produced, was born in 1694, (according to Piccini 1701,) at Naples. He surpassed all his predecessors, and possesses the singular merit of having equally succeeded in every species of composition. In one respect he has, perhaps, never been equalled, in expressing natural objects, such as the rushing of water, &c. by skilful accompaniments. All the works of this great master are regarded as models, which every Italian musician studies with veneration. He is the first who introduced rondos into his comic operas. He died in 1742.

LEO, the lion, and Leo minor. See MAMMALIA.

LEOMINSTER. See HEREFORDSHIRE.

LEON, a province of Spain, bounded on the north by Asturias, on the west by Galicia and Portugal, on the south by Estremadura, and on the east by Old Castile, is about 125 miles in length, and 100 in breadth; enjoys a fertile situation, and contains thirteen churches, besides convents, and a splendid cathedral. The soil affords plentiful crops of oats, maize, flax, and olives. The vineyards also are extensive in some places, and the mountains contain iron and copper mines. The principal rivers are, the Sil, the Alagon, the Duero, the Carrion, the Eresmo, and the Zormes. The chief towns are Leon, Astorga, Placentia, Tordesillas, Villa Franca, Benevente, Salamanca, and Ciudad Roderigo. This province is estimated to contain a population of 665,000. Cloths, hats, hosiery, and leather, are the chief manufactures. The inhabitants are in general taciturn and indolent in their disposition.

Leon, the capital, is situated on the river Esta; contains the finest cathedral in Spain, and a magnificent palace, together with that of the duke Alphonso, built in the 12th century. The population is less than formerly, and rated at 15,000. Cloth manufacture was formerly in a flourishing condition, but has of late declined.

LEON, ISLE of, a town of Spain near Cadiz, surrounded by a canal 10 miles in length, and qualified, at high water, to admit the largest vessels, is a flourishing place, much resorted to by naval and military officers. It displays an amusing admixture of grandeur and poverty in its general aspect. The houses are large, and the streets wide and extended. The inhabitants are about 40,000.

LEONIDAS, king of Sparta, and renowned in the annals of Grecian heroism, was the son of Anaxander, and ascended the throne in the year 491, A. C. When Xerxes, with his immense army, invaded Greece, Athens and Sparta alone, of the larger states, resolved to offer resistance. The Spartans gave the command of their forces to Leonidas, who, in 480, A. C. marched to occupy the pass of Thermopylæ. He disposed his small body with so much judgment, that the Persians, on arriving at the pass, foreseeing the difficulty of forcing it, endeavoured to bring over Leonidas to their interest, and Xerxes sent to offer him the sovereignty of all Greece, as the reward of his treachery; which proposition was rejected with disdain. The haughty despot then sent a herald, requiring them to give up their arms. "Let him come and fetch them," was the heroic answer. Three times the Persians advanced into the pass, and were as often repulsed with great slaughter. At this conjuncture, a traitorous Greek, named Epialtes, led a chosen body of 10,000 men, by a private path, over the mountains, who, having put to flight the small body of Phocians who guarded it, appeared in the rear of the Greeks. Leonidas perceiving that all was lost, resolved to give a memorable example of devotion to his country. Xerxes having received intelligence that the passage over the mountain had been effected, again advanced with all his forces. The effects of courage, maddened by despair, were dreadful. Leonidas fell, surrounded with the lifeless trunks of his enemies; and his devoted followers, attacked on all sides, continued to defend his corpse, till they too were numbered among the slain. The grateful Greeks, in honour of the fallen, erected a splendid monument, and decreed the yearly celebration of warlike games above the dust they had hallowed by their patriotism.

LEONTODON, DANDELION, a genus of plants belonging to the Syngenesia class.

LEOPARD. See MAMMALIA.

LEPANTO, a sea port of European Turkey, situated on a gulf of the same name, is divided into four towns, which are surrounded by walls, and defended by a castle. It affords wine, oil, corn, rice, tobacco, and leather. The Turks have several mosques, and the Greeks two churches.

LEPAS, a genus of shell-fish. See CONCHOLOGY.

LEPIDOPTERA, the third order of insects in the Linnæan system. See ENTOMOLOGY.

LEPISMA, a genus of insects of the order Aptera. See ENTOMOLOGY.

LEPROSY, a disease indicated by white scurfy scales on the body. See MEDICINE.

LEPTOCEPHALUS, a genus of fishes of the order Apodes. See ICHTHYOLOGY.

LEPTURA, a genus of insects of the order Coleoptera. See ENTOMOLOGY.

LEPUS, the hare, a genus of quadrupeds. See MAMMALIA.

LEPUS, the hare, one of the forty-eight old constellations in the southern hemisphere.

LERIDA, an ancient town of Catalonia in Spain, is of a triangular form, with one principal street. It is an episcopal see, and contains a population of 18,000.

LERNÆA, a genus of worms of the order Molusca. See HELMINTHOLOGY.

LERWICK, the capital of the Shetland islands, situated on Brassa sound, and extending six miles along the sea coast, is a rendezvous for those engaged in the fisheries. The inhabitants are occupied in the manufacture of stockings and bed-rugs, besides straw-platting. Fort Charlotte commands the north entrance to Brassa sound.

LESBOS, now METELIN, also known by the names of Polosgia and Macoria, from the people who first settled in it, is a large island situated in the

Grecian Archipelago. Its chief towns are Methymna and Mitylene. It belonged to the Persians and afterwards to the Greeks; and being restored to liberty by Alexander the Great, it continued in this state till Pompey reduced it to a Roman province. The Turks are its present masters.

LESS, Gottfried, an eminent German divine, born 31st January 1736, at Conitz in West Prussia. When he had finished his studies at Halle, he settled in Dantzig, and in 1761 was appointed professor of Theology. On a journey to Holland and England in 1763, he became acquainted with Munchausen, who offered him the theological chair, and the office of first preacher to the university of Gottingen, of which he accepted, and entered upon the discharge of his duties at Michaelmas of the same year. As a pulpit orator, he was distinguished by an intimate knowledge of human nature, and excited attention not less by new and striking thoughts, than by pathos and impressive eloquence. As a professor, he set himself stedfastly to maintain the orthodox faith, and laboured to destroy the influence of the sceptical writings which Lessing and others directed against the Christian religion. For the fartherance of these objects, he published several works of great merit, both in the doctrinal and moral department of theology. When the royal dukes studied at Gottingen, he had the charge of their religious education, the substance of which was afterwards published, under the title " Sketch of a Philosophical Course of Christian Theology." The spirit of the times was, however, not to be controlled. Notwithstanding his talents, and former popularity, his lectures were deserted, and he himself stigmatized as a bigot. This did not prevent his being promoted, in 1792, to be court preacher at Hanover, and shortly after to be general superintendant and first spiritual counsellor in the Consistorium. He died in 1797. His best works are, *Beweis der Wahrheit der Christlichen religion* 1769, a classical work, which he afterwards remodelled and published with the title *Ueber die religion, ihre Geschichte, Wahl, and Bestatigung* 1783; and *Handbuch der Christichen, Religious Theory, sur Ausgeklartere,* which contains the outlines of his lectures in the University.

LESSING, Gotthold Ephraim, was born 22d January 1729, at Kamens in Lusatia, where his father was a clergyman. Having been sent to the university of Leipzig, he gave great dissatisfaction to his parents, by refusing to devote himself to the study of any particular profession, and by associating with persons whose characters gave them reason to apprehend that both his principles and conduct might in consequence be contaminated. This propensity seems to have accompanied him through life, for the greater part of it appears to have been spent in shifting from place to place, and in a corresponding variety of occupations. In his later years, however, he remained stationary in Wolfenbuttel, as librarian to the duke of Brunswick, where he died in 1781. He published many pieces both in prose and verse. In the drama, criticism, philosophy, the fine arts, and polemical divinity, he has given unequivocal proofs of genius; and the opinions he advanced on these subjects not only attracted general notice, but have been productive of salutary effects on the taste and literature of his country. He used every endeavour to counteract the prevailing taste for copying from French models, and called the attention of his countrymen to the mines of English, Spanish, and Italian learning. By his recommendation and example, he contributed in no small degree to introduce that discrimination and laborious investigation in matters of criticism, for which the Germans have since been distinguished. The influence of his writings was not less perceptible in that scepticism in matters of religion, which, for more than half a century, has prevailed to an alarming extent among the literati of Germany. The doctrines of pure Deism found in him both an eloquent and a zealous advocate; and his discussions on theological points led him into violent disputes, not only with the supporters of orthodoxy, but also with the abettors of that mixture of positive and rational religion, which had then become popular with a certain class, who ranked themselves among the enlightened, but who, in the opinion of Lessing only " exchanged one kind of ignorance for another." His drama entitled Nathan the Philosopher, (*Nathan der Weise,*) may be considered as his master-piece in polemical writing; and is farther distinguished for its pure and chaste diction, playful wit, and lively fancy, and may be justly ranked among the best models of German style and composition.

LESSONS are certain portions of the Holy Scriptures read in Christian churches during divine service, the performance of which, in the ancient church, was part of the duty of the catechumens. In the church of England, the course of lessons begins with the year, at Genesis, and, with the omission of the Chronicles, continues through the Old Testament; but the sundry lessons are differently regulated, and suited to particular occasions. Likewise the moral books of the Old Testament are read at stated seasons. With the second lessons the same course is observed both on Sunday and week days. The Gospels and Acts of the Apostles are read in the morning, and the epistles in the evening, in the order in which they stand, except on holy-days and saints days, when the lessons have a respect to the character of the saints whose name they bear. In Scotland these lessons are left to the choice of the officiating minister.

LETHARGY is an irresistible stupor and forgetfulness. See Medicine.

LETHE, in ancient mythology, one of the rivers of hell; or the river of oblivion.

LETTER, a character used to express a simple sound of the voice. Letters properly combined form the visible signs of those sounds by which we communicate our ideas. (See Language.) The origin of letters has been matter of controversy, and various are the conjectures concerning the different kinds of letters in different languages. Moses is supposed by Crinitus to have invented the Hebrew letters; Abraham, the Syriac and Chaldee; the Phœnicians, those of Attica; Nicostrata, the Roman; Isis, the Egyptian; and Vulsilas, those of the Goths.

Letter, or Type,—see Printing. Also a writing, folded, and addressed to some person.

Letter of Attorney, an instrument by which one person transfers to another full authority to

PLATE 110.

Fig. 1.

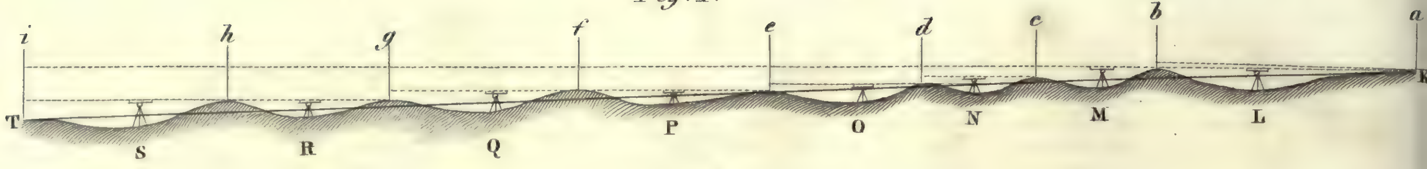


Fig. 2.

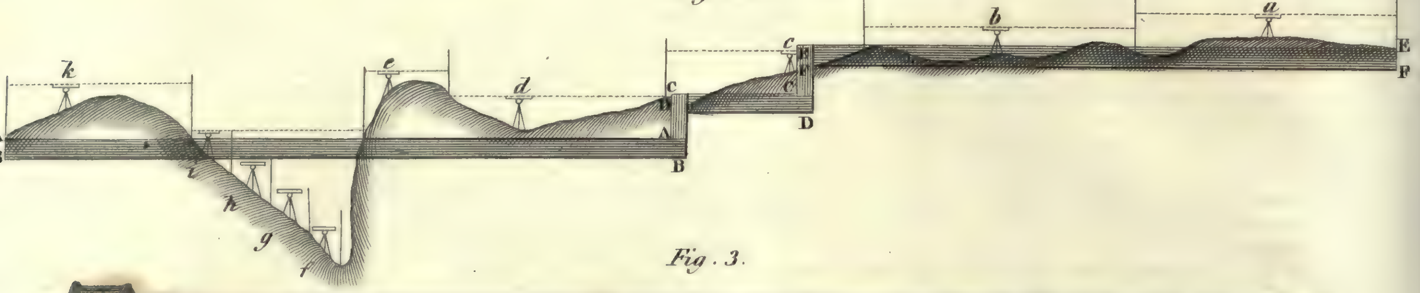


Fig. 3.

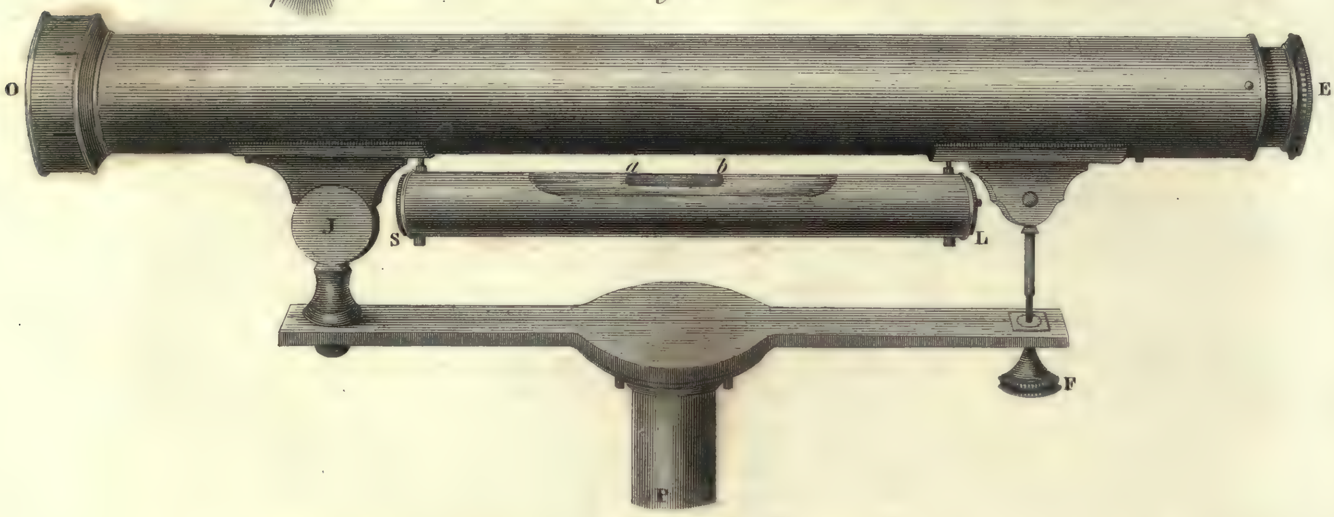


Fig. 4.

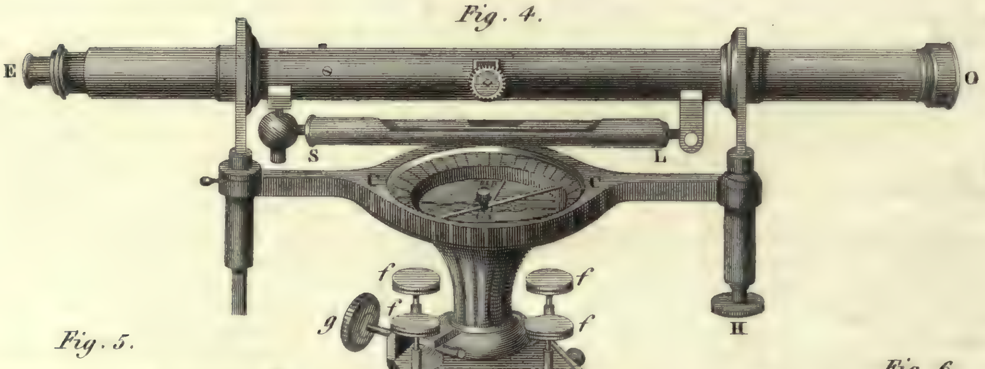


Fig. 5.

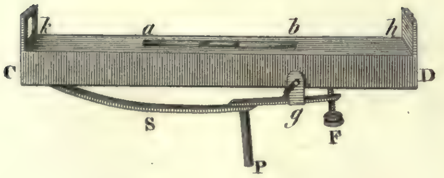
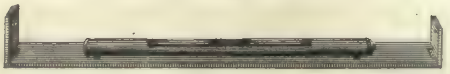


Fig. 6.



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do a lawful act in his stead, and is either general or special; but it is irrevocable when debts, &c. are assigned from one person to another. In most cases the power thus given determines upon the death of the person who gave it.

Letters of Mart, or Marque, are powers granted by the Admiralty, authorising to cruize against the enemy. Under the privy-seal, also, letters are granted authorising the king's subjects to recover by force of arms what had been taken by another state contrary to the law of Mart.

Letters-Patent, or Overt, are open deeds, which have the great seal of England affixed to them, and which authorise a person to do or enjoy what of himself he could not do by virtue of his own power.

LETTUCE, Lactuca. See Gardening.

LEUCIPPUS, a philosopher of the Stoic school, and preceptor of Democritus, flourished 500 years before the Christian æra. Of his history little is known, and the place of his birth is uncertain. Dissatisfied with the doctrine that every thing existing has been derived from a simple, eternal, and unchangeable substance, he became the founder of a new system, which assumed an infinite multiplicity of self-existent atoms, and from the movements, and casual combinations, and separations of these, explained the origin of the world, and of the successive changes that are every where taking place. Fire he considered as the soul of the world, and as the principle of life, thought, and feeling. The soul, consisting of atoms of fire, is distributed over the whole body; men and animals inhale it with the air they breath, and hence, when breathing has entirely ceased, life is extinct. The soul of the world, as well as all things else, are the effects of blind chance, and the gods are entirely excluded from his system.

LEUWENHOEK, Anthony, a Dutch philosopher, well known for his microscopic discoveries and experiments in natural history, was born at Delft in Holland in 1632, and died in 1723. Dr De Graaf first recommended him to the Royal society of London, of which he became a fellow in 1680; and in 1697 he was made a corresponding member of the academy of Sciences at Paris. He contributed memoirs, and was a member of most of the literary societies of Europe. To the Royal society he bequeathed a small Indian cabinet, consisting of thirteen boxes or cases, each containing two microscopes beautifully fitted up with silver, and entirely of his own workmanship, together with a written description of the objects attached to each microscope.

LEVANT, that part of the Mediterranean sea which is bounded by Natolia on the north, by Syria and Palestine on the east, by Egypt and Barca on the south, and by the island of Candia on the west.

LEUCTRA, a town of Bœotia, famous for the battle between the Spartans and Thebans, the ancient remains of which, according to Dr Clarke, are extensive, and occupy as large a space as that of a large city.

LEVEL. See Mensuration.

LEVELLING is the art of tracing lines parallel to the horizon, and furnishes a direct and accurate way of determining the relative heights of different points on or near the surface of the earth. The instruments used in it, called *levels*, are of various constructions, all operating by the direction of gravity; as the plumb-level, so much used by artizans, the water-level, and the spirit-level. The latter, by its being conveniently combined with the magnifying power of the telescope, is the best adapted to large surveys, and the most expeditiously used in practice. We shall, therefore, confine our descriptions to that elegant instrument.

The spirit-level is a cylindrical glass tube, containing a quantity of alcohol and a small portion of air, which, it is evident, when the tube is hermetically sealed, will always arrange themselves so that the lighter fluid becomes stationary in the highest part of the interior. It is also evident, that when the cylinder is placed with its axis parallel to the horizon, the portions of alcohol at each extremity will be of equal heights, and will exert equal pressures, so that the air will appear to take its station on the upper side, at equal distances from both ends; and, accordingly, this position is regarded as the proof of the instrument being correctly horizontal.

In Plate 110, figure 3. *SL* is the spirit-level, with the air bubble at *ab*. *OE* is an attached telescope, with the object-glass at *O*, and the eye-piece at *E*. In the focus common to both glasses is a cross or horizontal filament of silk or other slender matter, marking the line of collimation, which is adjusted parallel to the level. The telescope is elevated or depressed at pleasure by means of the joint or hinge *J* and the finger-screw *F*, till the air-bubble becomes stationary at the middle of the tube. *P* is a pivot moveable in the top of a staff or other stand, and admits of the telescope being turned round, so as to bear on any object on the same horizontal plane with itself. The cross filament in the centre marks on any object that point which is apparently on the same level with the focus. We say *apparently* on the same level, for, in reality, any point in the direction of the line of collimation is situated in the tangent to the circle of which the centre of gravity of the earth is the centre, and the radius a straight line joining the centre and the point at which the observation is made. Points marked in the direction of the spirit-level are reduced to their true places in the spherical surface, by subtracting the spaces contained between the said points in the tangents and the curve in the earth's surface, together with a quantity for refraction. The former of these allowances is called correction for curvature, and the latter horizontal refraction. The method of computing both will be shewn in the sequel.

Figure 4. is a representation of another instrument on similar principles. The level and telescope are as described before. It has a compass, *CC*, for ascertaining the bearing of any observation relatively to the magnetic meridian. The whole is supported by a tripod, *AAA*, the several members of which move in joints fixed under the plate *PP*, in the centre of which plate is a round hole or socket embracing a moveable ball, this ball having a stem passing upward as an axis round which the upper part of the instrument is moved. Around the stem just mentioned, and fixed to it, is the plate through which the finger screws *ffff* pass, the points of these screws being made to press upon the plate *PP*, so as to incline the higher parts of the instrument in any direction wished, till a horizontal position is attained. The large stem immediately under the compass is a hollow tube, which has fitted into it the upper part of the stem, passing upward from the socket in *PP*. The former of these stems turns round on the latter by means of the male finger-screw, the milled head of which is at *g*, and which works on an endless screw fixed on the lower stem. By turning the screw at *g* the telescope is moved round, that it may be directed toward an object on any point of the horizon. *H* is a hand-screw for elevating or depressing the object end, *O*.

Figure 5. is a perspective view of a spirit-level, *a b*, imbedded in a stock or frame of timber, *C D*; at *D* is an upright plate pierced by an eye-hole at *h*, and at *C* is another upright plate with a wide aperture through which (at *k*) is a horizontal hair or other filament. The eye-hole at *h*, and the cross hair at *k*, serve as sights, and are at equal heights above the surface of the spirit-level. The instrument is supported by a staff or rod, into the head of which a hole is bored for receiving the pivot *P*. To the pivot is attached the spring *S*, connected with the stock at *g*. By turning the screw *F*, the spring is made to press hard or softly on the stock, raising or lowering the end *C* as may be found necessary.

Figure 6. is a level similar to the last, but fitted up without any pivot, and on that account well adapted to be directly applied to the work of builders, carpenters, and other artificers.

The correction for curvature being the perpendicular included between the apparent level or tangent, and the convex side of the curve formed by the earth's surface, the extent of that perpendicular varies in the ratio of the square of its distance; thus, if *L* be the horizontal distance in English miles, the correction in feet to be subtracted is $\frac{2L^2}{3}$.

As the tendency of horizontal refraction is to cause objects to appear higher than they really are, the correction is a quantity to be added to the correction of curvature, the sum of both, taken from the apparent level, leaving the true one.

It being found that the refracted ray in the mean state of the atmosphere enters the eye with the same inclination as a curve whose radius is 7 times the semidiameter of the earth, it follows that the quantity to be allowed for is $\frac{2L^2}{21}$ equal to $\frac{1}{7}$ of the correction for curvature. Two tables, exhibiting the compound effects of curvature and refraction, deduced from the foregoing formulae, are subjoined.

Of the several methods adopted in conducting the process of levelling, that illustrated by figure 1. is recommended, as being attended with the utmost facility, and otherwise advantageous. The curved line from *K* to *T* is a profile of an irregular surface, the relative heights of whose asperities are to be ascertained. This is done by placing the instrument as at *L*; a straight pole or rod, *a*, is then erected at *K*. The telescope is then placed in a horizontal position, and made to bear on the rod, which is held by the hand of an assistant, who slides a moveable vane upward or downward upon the rod as directed by signal. When a coloured line on the vane is brought exactly before the cross-hair of the telescope, and seems as if covered by that filament, the assistant is directed to clamp the vane firmly in its place. The rod is then carried to another point, as at *b*, and the telescope is turned round till it bears upon the rod; the level is again adjusted, and the assistant ordered to move the vane till it is brought into the direction of the telescope, where it is made fast. The difference between the last and the former place of the vane is then measured, and the quantity so found is the difference of the apparent levels of the two points at *a* and *b*. In like manner, the instrument is successively placed at *M*, *N*, *O*, *P*, *Q*, *R*, and *S*, and the relative levels of all the intermediate parts, as *b c*, *c d*, &c. are found; and when all the quantities are collected into one sum, the total apparent fall from *K* to *T* is determined. It is plain, that when the various heights are obtained, and the several distances measured, the operator has it in his power, by the use of a scale, to construct such a profile as the figure; and in the case of its being wished to smooth the whole interval into one regular slope, that slope may be represented on the profile by drawing the straight line *TK*, and the depths of the various eminences to be removed will be shewn on the profile, or may be calculated from the heights and distances obtained as above.

The curved line from *A* to *E*, figure 2. may be determined in all its dimensions by planting the instrument at *a*, *b*, *c*, *d*, *e*, *f*, *g*, *h*, *i*, and *k*, and by proceeding in other respects as above directed. After the curved line is delineated on the profile, the engineer is furnished with excellent data for conducting a canal over the uneven ground surveyed, as he can then adjust the several levels, so that the sites of the locks may be fixed on, and the high ground to be removed may be of the proper quantity for embanking the hollows. The straight lines *AA*, *CC*, and *EE*, exhibit the surface level of a canal adapted to the ground, and the lines *BB*, *DD*, and *FF*, the bottom level. *AD* and *CF* are the heights of two locks.

TABLE

Shewing the compound correction for curvature and refraction, in inches and decimal parts of an inch.

Distances in yards.	Corrections.	
	In.	Dec.
100	0	027
200	0	117
300	0	209
400	0	471
500	0	737
600	1	056
700	1	440
800	1	884
900	2	387
1000	2	950
1100	3	571
1200	4	239
1300	4	979
1400	5	778
1500	6	637
1600	7	555
1700	8	514
1760	9	143

TABLE

Shewing correction for curvature and refraction, in feet, inches, and decimals of an inch.

Distances in miles.	Correction.		
	Feet.	In.	Dec.
1	0	9	143
2	3	0	571
3	6	10	286
4	12	2	286
5	19	0	571
6	27	5	143
7	37	4	
8	48	9	143
9	61	8	571
10	76	2	236

Levelling Staves, rods or poles used in levelling. See Mathematics.

LEVER, in mechanics, an inflexible line, rod, or beam, moveable about or on a fixed point called the prop or fulcrum, on one end of which is the weight to be raised, and the other the power applied to raise it. The lever is of five kinds. See Mechanics.

LEVERET, a young hare in the first year.

LEVIGATION, the reducing of hard substances, as coral, precious stones, &c. to an impalpable powder. See Pharmacy and Chemistry.

LEVITES, in Scripture history, one of the twelve tribes of Israel. The Jewish priests were chosen from the tribe of Levi; but the term Levite applies to an order of officers subordinate to the priests, and who, although the ordinary judges of the country, also performed the manual services of the temple. They enjoyed the tithe of corn, fruit, and cattle; but the priests received a tenth of their tithes as an offering of the first fruits to the Lord. The priests were consecrated by imposition of hands, and the sacrifice of two bullocks at the door of the tabernacle; preparatory to which were performed the acts of shaving, washing their clothes, and sprinkling with water. Their weekly attendance in the temple was by turns, commencing on the one Sabbath and ending the next. The number of Levites, in the time of Solomon, qualified to serve at the altar, was 30,000. The number of their cities was forty-eight; of these the priests claimed thirteen, six whereof were cities of refuge.

LEVITICUS, a book of the Old Testament, so called from the regulations it contains respecting the priests, Levites, and sacrifices.

LEVITY, a term opposed to gravity, and, in natural philosophy, signifying that property of a body by which it is lighter than another body of equal bulk. Archimedes proved that a solid will float any where in a fluid of the same specific gravity, and that a body of less weight than the fluid in which it is immersed will always rise to the surface of the fluid.

LEVY, to gather or collect money; or to pass a fine of lands.

LEWES, a market town of Sussex, situated on the river Ouse, which is navigable for barges; contains six parish churches, and a town-hall, wherein are held the summer assizes. The population is above 6,220. Several iron-works are established here, where cannon are cast. Lewes is a borough of considerable antiquity, and remarkable for a battle in 1263, in which Henry III. and his son were taken prisoners by the barons.

LEWIS, one of the largest and most northern of the Western islands of Scotland. See Hebrides.

LEXICON, a dictionary, containing an explanation of the words of a language; generally used to denote a Greek dictionary. The oldest Greek lexicon is the Onomasticon, which was written 180 years before Christ. Hesychius of Alexandria, of whom nothing more is known than that he lived somewhere between the years 201 and 600, was the first among the Christians who wrote a Greek lexicon, which he termed a Glossary. After the revival of learning, Johannes Crastonus, or Placentinus, from his birth place Placenzia, edited the first Greek and Latin dictionary, in 1483, at Vicenza. Among the Romans, M. Terentius Varro, was the first who formed a Latin lexicon. Another was written at a much later period by Johannes Balbus, (de Balbis, de Janua, died 1298,) which was printed at Mayence 1450, entitled Catholicon. The first Hebrew lexicon came from the pen of Rabbi Menachem Ben Saruck (Ben Jacob) in the 9th century; similar ones were published by Johann Reuchlin, at Pferzheim 1506, and Johann Forster, at Basil, 1564. The first Arabic lexicon, among the Christians, was published by Peter de Alcala, 1505, at Granada, in the Spanish language. The first Syriac lexicon is from the press of Andreas Masius, 1571, at Antwerp; the first Æthiopic, by Ludolf, London, 1661; and the first Hebrew, Greek, and Latin, by Sebastianus Munster, Basil, 1530.

LEYDEN, *Lugdunum Batavorum,* a large and flourishing city of Holland, with spacious streets and numerous canals, situated on a branch of the Rhine, with 3000 houses, and 31,000 inhabitants. The university, founded in 1575, has long been celebrated, and is distinguished by its botanical garden, anatomical theatre, observatory, and a valuable library, with many rare manuscripts. The principal buildings are St. Peter's church, containing the sarcophagus of Boerhaave, and the monuments of Peter Campen and Mermann; and the town-house, in which is preserved Lucas of Leyden's admirable painting of the Day of Judgment. Leyden is the principal place in Holland for the manufacture of woollen stuffs, and for the internal commerce of the United Provinces in wool. Linen, camelots, and yarn for stockings are also prepared, and there are salt-pans for the making of salt. Leyden is the birthplace of John Leyden, the taylor, who, with the title of king, placed himself, 1526, at the head of the Anabaptists in Munster; of the celebrated naturalist Peter Van Muschenbrock, and several other eminent characters.

LEYDEN, John, M. D. a native of Teviotdale, remarkable for his romantic cast of mind and close application to learning, was born at Denholm in 1775. At the age of ten years he was first put to school; but so little assistance had he in acquiring the rudiments of learning, that to the energy of his own intellectual powers is to be attributed the rapidity of his attainments; and indeed he himself has remarked, that his facility in acquiring languages was to be traced to his juvenile habits of determined investigation. The parents of Leyden remarking his devotion to learning, resolved on having him qualified for the church of Scotland. A clergyman at Denholm became his tutor in the Latin language; and it is understood he had attained some knowledge of the Greek before he commenced his professional studies at the university of Edinburgh in 1790, where he spent five or six years. After this he was for two years occupied as private tutor to the sons of Mr Campbell of Fairfield, then residing in the vicinity of Mid-Calder, whom he attended to the university of St Andrews. The renown of Mungo Park's researches fired the enthusiasm of Leyden, and the result of his oriental enquiries was the publication of

"A Historical and Philosophical Sketch of the Discoveries and Settlements of Europeans in Northern and Western Africa at the close of the 18th century," which appeared in 1799. Subsequent to this period he was ordained a preacher of the gospel. In 1801 he was a contributor to the "Tales of Wonder," published by Mr Lewis. He was actively engaged in collecting materials for the "Minstrelsy of the Scottish Border;" and in 1802 he acted as editor of Constable's Magazine, to which he also made occasional contributions. The "Scenes of Infancy," a poem, now employed his thoughts; and in the midst of his various occupations he kept the study of Scottish antiquities always in view. The discoveries of Mungo Park excited in the enterprising mind of Leyden a strong desire of travelling and adventures. A representation of his talents and disposition was made to the Right Hon. William Dundas, who entered warmly into his views; but had then no appointment in his power except that of surgeon's-assistant; to obtain which, a surgical degree was indispensable. Notwithstanding the difficulties to be encountered, Leyden accepted of the appointment with its conditions; and, assisted by Mr John Bell, he gave himself wholly to the study of medicine and surgery. His powers of application and comprehension were in this undertaking admirably displayed, for he was qualified in the course of about six months to obtain his diploma at Edinburgh. He set out as assistant-surgeon on the Madras establishment; and during his voyage his whole mind was devoted to the study of Oriental languages. Accompanying the governor-general to the island of Java, Dr Leyden designed to investigate the manners, language, and literature of the tribes who inhabit it; but he fell a sacrifice to his own enthusiasm. Along with another individual, he threw himself into the surf in order to be the first Briton of the expedition who should reach Java; and when Batavia had been taken possession of, he hastened to examine a library in which some Indian manuscripts had been deposited. While engaged in this employment, he was seized with a fit of shivering, occasioned perhaps by want of ventilation, or more probably symptomatic of the disease peculiar to the island; and his career of usefulness and eminence, after an illness of three days continuance, was terminated on the eve of the battle which added Java to the dominions of the British king. His ashes were consigned to the tomb by Lord Minto, with every mark of respect. Mr Heber, and Dr James Hare of Calcutta, now of Overton, were his executors, and were entrusted with his literary remains; but lately, on the return of the latter gentleman to this country, Mr Heber was put in possession of the whole. Dr Leyden no doubt possessed very superior talents, but his chief error consisted in attempting more than was possible for any individual to accomplish, as he was known to be engaged in the study of no less than eight or ten different languages at one time.

LEYDEN-PHIAL, a glass phial or jar, coated with tin-foil, and capable of receiving and retaining an electric charge. See ELECTRICITY.

LIBATION, an essential part of solemn sacrifices, consisting of an offering of liquid, as wine, or milk, poured out in honour of some heathen deity, or performed alone as a drink offering. Libations were also in use among the Hebrews, who poured wine on the dead victim, and then laid the several pieces on the altar to be consumed.

LIBAU, a small Russian town and haven, in the former dukedom of Courland, on a river of the same name, which here falls into the Baltic. It has 450 houses, chiefly of wood, one Catholic and two Lutheran churches, and contains 4,500 inhabitants. It has a considerable trade in hemp, linseed, &c. with which 200 vessels are annually freighted. The value of these exports amounts to 700,000 rubles yearly. The haven is shallow, and vessels of any considerable burden must remain in the roads.

LIBEL, in law, an injurious accusation, written and published to expose a person to contempt. In Scottish law, the term implies an indictment.

LIBELLULA, the dragon-fly. See ENTOMOLOGY.

LIBER, an ancient Latin term, denoting the inner bark of a tree.

LIBERAL ARTS are such as regard amusement or curiosity more than real necessity. Among these may be classed rhetoric, painting, sculpture, music, &c. See ART.

LIBERTINES, *Libertini*, a religious sect which arose in 1525, and gained some footing in France, Holland, and Brabant. They were denominated libertines from the extravagance of their tenets, and their indulging, without restraint, their appetites and passions.

The Libertines of Geneva consisted of the most dissolute characters, who not only disliked the moral discipline of Calvin, but held all religion in utter contempt, and were notorious for their scandalous manner of living.

LIBERTY, a state of freedom as opposed to slavery, or the power a man has to do or forbear doing any particular action at his pleasure. According to Cicero, natural liberty is the power of living as a man pleases, or without being controlled by another. Liberty or freedom of the will is a right inherent in every man by birth, by which he is capable of acting, choosing, or rejecting whatever he may judge proper. The actual exercise of this power is termed volition, and the agent capable of acting in this manner is denominated free. On the other hand, wherever doing or not doing will not equally follow upon the choice of the mind, there the agent is not free, although the action perhaps may be voluntary. Society, however, requires that this natural liberty be restrained within reasonable and proper limits, and has, therefore, established certain laws for its regulation and government. A person, therefore, may be restrained from doing injury to another, and may still be in the full enjoyment of *political* or *civil liberty*. The natural liberty of the individual may thus diminish in proportion as his civil or political liberty is increased. The public laws of any state, therefore, if founded upon just and reasonable principles, are in their nature calculated not to subvert but to establish and confirm political or civil liberty, the public advantage often requiring the control of private inclinations. The rights of British subjects therefore have been termed their liberties, which they are entitled to enjoy entire, such as the free enjoyment of personal security, personal liberty, and private property; and so long as these remain inviolate, the subjects of this government may be considered as perfectly free.

The liberty of the press in Britain was, after many various contests, finally established in 1694, and seems to be essential to the very nature of a free state. By this liberty, every man has a right to set forth his sentiments and opinions before the public; but should he at any time publish any thing improper or illegal, he becomes responsible in damages for his audacity. Whilst therefore the will is left free, the abuse of that freedom is liable to legal punishment.

Liberty, a goddess held in great veneration among the Greeks and Romans, in honour of whom magnificent temples, altars, and statues were erected. She is represented holding the symbol of liberty in one hand, and two poniards in the other.

LIBRA, or Balance. See Mechanics.

Libra, one of the forty-eight old constellations, and the seventh sign of the Zodiac, so called because, when the sun enters it, the days and nights are equal all over the globe. See Astronomy.

Libra, a Roman gold coin, equal to twenty denarii. The Roman pound was also so denominated, and consisted of twelve ounces or 5040 grains.

LIBRARY, an apartment adapted for the reception of books; or the books arranged therein.

The origin of libraries is referred to the Hebrews, who, in their preservation of the sacred books, set an example to other nations. The Ptolemies of Egypt are said to have had magnificent libraries. In the Alexandrian library were contained 700,000 volumes, which were destroyed by fire; and the same fate consumed the library at Constantinople, which in the eighth century consisted of 300,000 volumes. The Ulpian and the Palatine libraries were the most celebrated of ancient Rome. At Athens, the first library erected was that of the tyrant Pisistratus. In the sixteenth century, every large church had its library. The library of Cosmo de Medicis at Florence is only rivalled by the National library of France, which is the best collection in the world, consisting of 350,000 printed books; from 70,000 to 80,000 manuscripts, and 50,000 portraits. The imperial library of Vienna contains 300,000 printed books, and from 12,000 to 15,000 manuscripts.

In Great Britain, the Royal library, those of the British Museum, Oxford, Cambridge, and the Advocate's library in Edinburgh, are the most important. The Royal library at St. James's is said to contain 80,000 volumes, besides manuscripts and curiosities; that of the British Museum is the most valuable in the kingdom; and the Advocate's library in Edinburgh contains about 80,000 printed works, and 1000 volumes in manuscript. Besides these, the other public libraries in the kingdom are numerous and extensive.

LIBRATION of the Moon, and Motion of Libration. See Astronomy.

LIBYA, the ancient name of Africa, but now restricted to that part extending north and west between the Mediterranean to the north and Ethiopia to the east.

LICENCE, an authority given to do a lawful act.

LICENTIATE, an officer of justice in Spain; among us, a physician licensed to practise.

LICHEN, Liverwort, a genus of plants belonging to the Cryptogamia class. See Botany.

LICHFIELD, or Litchfield, a city of Staffordshire, united with Coventry into an Episcopal see. It is divided by a small river into two parts, and contains some elegant buildings, three parish churches, and a cathedral which is among the finest and most noble pieces of architecture in England, and with a portico hardly ever equalled. The population exceeds 5000. The principal manufactures are sheeting and canvas, and the brewing of ale. A weekly market is held on Friday, besides an annual fair for cattle, sheep, &c. Lichfield claims the honour of being the birth-place of Dr Samuel Johnson, and the place where Addison, Woolaston, and Garrick were educated. It sends two members to Parliament.

LICHTENBERG, celebrated among the Germans for his scientific attainments, and particularly for a rich fund of wit and humour, was born near Darmstadt, 1st July 1742. Having finished his preliminary studies with great eclat, he went, at the age of 19, to Gottingen, where he devoted himself with great assiduity to the study of the natural sciences, particularly astronomy, for which he discovered great abilities. In the spring of 1770, he accompanied two young Englishmen of rank to England, where he had the good fortune not only to become acquainted with many scientific men, but to be introduced to the king, who received him with great kindness, and afterwards patronised him. The same year he received an invitation from his paternal state to become professor of mathematics at Giessen, but was induced to remain in Gottingen by receiving a like appointment in that university. He made a second journey to England in 1774, from which he derived great improvement, both in science and taste, of which he gave a specimen in his excellent letters on Garrick and the English stage, which were published on his return. An opportunity for exercising his inimitable talent for wit and ridicule was presented to him in the foolish admiration, and no less inconsiderate application, of Lavater's System of Physiognomy, then published, which he exposed with infinite humour in a pamphlet entitled "Timorous, or a defence of two Israelites, who, induced by the efficacy of Lavater's arguments, and the Gottingen sausages (made of *swine's blood and fat,*) have adopted the true Faith—by Conrad Photorin, candidate of Theology and Belles-lettres." This satirical attack was renewed in his essay "On Physiognomy, against the Physiognomists, for the promotion of benevolence and knowledge of mankind." To the same class belongs his sketch "Fragments of Tails," from which he attempts to trace character in the swinish race, as Lavater from the outline of the nose in a nobler animal. Still more did he display his talent for the delineation of character, and feeling of the humorous, in his illustrations of Hogarth, which appeared from time to time in the Gottingen Calendar, accompanied with heads copied from the works of Hogarth.

The universal applause with which these attempts were honoured, induced him to undertake a complete work on the subject, entitled *Ansfuhrliche Erklarung der Hogarthischen Kupferstiche mit verkleimerten, aber vollstandigen Copien derselben von Riepenhausen,* begun in 1794. The five first numbers, however, only are by Lichtenberg; the remaining six are by Bouterweik. This work has been translated into English, and is the best illustration extant of those inimitable performances, which are here commented on with congenial humour and talent. He died of inflammation of the breast in 1799.

LICTORS, public officers among the Romans, who waited upon the magistrates in the exercise of their functions. They were introduced by Romulus, who borrowed the institution from the Etrusci. Their badge of office was an ax and a bundle of rods, (fasces,) significant of the greater and less severe penalties of the law. Of these, Romulus employed twelve to go before him. When the regal power was overthrown, its external pomp was retained; hence the consuls, dictators, proctors, &c. when they appeared in public, were preceded by lictors. The duties of their office consisted in clearing the way among the crowd for the magistrates to pass, (*turbam submovere*;) in securing the observance of due deference and decorum, which required that those who were on horseback should alight and stand uncovered at a respectable distance; and, lastly, in giving effect to the sentence of the consuls. The lictors were taken from the lowest class of the people, and were generally the freedmen of those upon whom it was their duty to attend. The dictator was preceded by twenty-four; the consuls, decemvirs, and tribunes with consular power, by twelve; the proctor by six; a like number preceded a magister equitum; and one went before a vestal virgin.

LIEGE, in law, a vassal or person bound in obligation to another, from *lie* to bend; and the vassal was bound to serve his lord against all but his own father. Liege-lord is one who acknowledges no superior, while a liege-man is one who owes allegiance to the liege-lord. In Great Britain, lieges is a term applied to the king's subjects, who are sometimes called lieges or liege people.

LIEGE, a territory of the Netherlands, is bounded on the north by Brabant and Upper-Gelderland, on the east by Juliers and Limburg, on the south by Luxemburg and the Ardennes, and on the west by Hainault and Namur. The produce of corn, fruit, and tobacco, is abundant, and mines of iron, lead, and coal, are worked, together with quarries of marble.

Liege, the capital of the territory, one of the largest cities in Europe, is four miles in circuit, has 16 gates, 17 bridges, and contains 154 streets, and has also very extensive suburbs. Besides the cathedral and a number of churches, this city contains a castle, palace, town-house, and an arsenal, and is celebrated for its university. The principal manufactures are fire-arms, cloth, leather, glass, hardware, and earthenware. The river Meuse passes through in three different branches. In 1734, the bishop's palace, with his furniture and writings, were destroyed by fire. The French took this city in 1792, and, being afterwards repulsed, they retook it in 1794.

LIEUTENANT, a civil officer, who supplies the place of a superior in his absence, such as the lord-lieutenant of a county or kingdom. It also denotes a military distinction, as lieutenant-general, or lieutenant-colonel. A lieutenant in the land service is an officer next to the captain, and who takes the command upon the death or absence of his superior. In the artillery, each company has a first and three second lieutenants. The first lieutenant does the same duty as the captain, and is assisted by the second, who is the youngest commissioned officer. In *a ship of war,* the lieutenant has full power to act in the absence of the captain. The lieutenant of the watch keeps a correct list, musters the men, and reports who are absent. He must be as constantly on deck as possible, to give necessary orders, or, in time of battle, to see each man at his post. The youngest lieutenant in the ship trains the seamen to the use of small arms.

A lieutenant reformed, is one who preserves his rank and half-pay in the army, though his company be disbanded.

LIFE, in physiology, denotes the animated state of living beings.

LIFE-ANNUITIES are periodical incomes, depending on the continuance of one or more lives. See ANNUITIES.

LIFE-BOAT is a boat of particular construction, qualified to resist the violence of a stormy sea, and thus afford relief in the season of danger. See SHIPBUILDING.

LIGAMENT is any thing that ties or binds one part to another. In anatomy, the term denotes a substance which encloses or keeps together the junctures of the body.

LIGATURE is a bandage of extensive use in surgery, and one of the means of effectually stopping bleedings from arteries.

LIGATURES, among printers, are types consisting of two letters, as ff, fi, &c.

LIGHT, small particles of matter emitted from the sun in rays, with a velocity so immense as to move at the inconceivable rate of 12,000,000 of miles in a minute. It has been calculated that these particles follow each other at the rate of 480 in a minute, and, notwithstanding their velocity, and the rapidity of their succession, they are 24,000 miles asunder. The larger and grosser of these rays are supposed to produce red and orange colours, and the smaller ones violet and blue; a compound of all the rays produces white, and the absence of them black. The colour of the object viewed, depends upon the greater or smaller rays that are absorbed or reflected. When a ray of light passes out of one medium to another, it is refracted or turned out of its first course. On this principle depends the construction of telescopes and other optical instruments. See CHEMISTRY.

LIGHT-ROOM, an apartment, inclosed with glass windows, near the magazine of a ship of war, where cartridges are filled with powder for action.

LIGHTER is a vessel employed in carrying goods to or from a ship as circumstances require.

LIGHTFOOT, John, a learned divine, was born at Stoke upon Trent in Staffordshire, in 1602; received his early education at a school in Cheshire, and, in his fifteenth year, was removed to Christ's college, Cambridge. Having made considerable proficiency in the Latin and Greek languages, he became assistant in a school in Derbyshire, after which he took orders. Becoming chaplain to Sir Rowland Cotton, who was an adept in the Hebrew language, Mr Lightfoot commenced that study; and, being presented to a living at Hornsey, near London, he had the advantage of Sion college library in the prosecution of his studies, and gave to the world his *Erubhim*, or Miscellanies, Christian and Judaical. In 1631 he obtained the rectory of Ashley in Staffordshire, where he continued till 1642, when he removed to London. In the assembly of divines which met in 1643, Mr Lightfoot was warmly engaged. In 1645 he accepted the mastership of Catherine-hall in Cambridge, together with the living of Much-Munden in Hertfordshire, and occasionally preached before the House of Commons. At this period also he was engaged in preparing and publishing his "Harmony." Taking the degree of doctor in divinity in 1652, he some time afterwards entered upon the office of vice-chancellor of Cambridge, the duties of which he diligently performed, while at the same time he lent his aid in perfecting the Polyglot Bible, then issuing from the press. He died in 1675, in the 74th year of his age. Dr Lightfoot was a man of exemplary character. He was conversant in Rabbinical literature, and accounted a superior commentator. His works, consisting of two volumes folio, were published in 1684.

LIGHTFOOT, John, a distinguished botanist, was born at Newent in Gloucester, in 1735, and educated at his native place, whence he removed to Pembroke college, Oxford. Having completed the necessary course of studies, he became curate at Colnbrook, and latterly at Uxbridge. He was an eminent scholar, and deeply conversant in the studies of botany and conchology. Accompanied by Mr Thomas Pennant, he made a voyage to the Hebrides in 1772; and his indefatigable researches in natural history, previous to and during this excursion, afforded matter for his celebrated work, the *Flora Scotica*, which was ushered into the world under the kind auspices of Mr Pennant in 1778. This work is very justly esteemed; and it comprises a systematic arrangement of the indigenous plants of Scotland.

In 1780 Mr Lightfoot married the daughter of Mr W. Burton Raynes of Uxbridge, by whom he had two sons and three daughters. He died in 1788.

LIGHTHOUSE, an edifice constructed near the sea-coast, and in which lights are exhibited for the direction of mariners. The fire-towers of the ancients served for this purpose, and also as fortifications. These towers were square or circular, with a battlement at top. They were dedicated to the gods, and were the residence of priests, who regularly offered sacrifices for the safety of the mariners. But in course of time these sacred towers became scenes of barbarous cruelty, when the priests and priestesses had abandoned themselves to every thing vicious; and though once very numerous on the coasts of the Mediterranean and Red seas, they gradually disappeared. The Pharos of Alexandria, however, continued for ages one of the wonders of the world. It is said to have been a square building of granite, on the top of which a fire was constantly kept burning, and was erected 300 years before the Christian era. The lighthouses of modern times are far superior to those of antiquity; and the most remarkable of our own country are the Eddystone, the Bell-rock, and South-rock lighthouses. Descriptions of the Eddystone and the Bell-rock have been given in the order of the alphabet.

The Kilwarlin, or South-rock lighthouse, is favourably situated off the coast of Downshire in Ireland. It was founded in 1795, and constructed by the late Mr Rogers, engineer for the Board of Customs. Part of the rock on which it stands is always above the perpendicular rise of the tide, but the foundation of the lighthouse is only about five feet above low water of spring-tides. This lighthouse measures thirty-one feet in diameter at the base, and the height from the medium level of the sea to the top of the light-room is seventy feet.

LIGHTNING, a vivid flash darting through the atmosphere, and frequently accompanied with thunder. See Electricity.

LIGNE, (Carl Joseph, Prince of) equally renowned as a warrior and an author, was born at Brussels, 22d May 1735. Descended from one of the most ancient and noble families of Belgium, he entered, 1755, into the military service of Austria, to which the Netherlands then belonged, and greatly distinguished himself in the successive wars in which that country was engaged, down to the era of the French revolution. In the arts of peace he no less excelled. Of high honour, and elegant accomplishments, he was the charm of every society in which he mingled, and was equally a favourite with the empress of Russia, whom he accompanied on her journey to Cherson, and with the refined court of Versailles, where he spent some time by special invitation. He spent the evening of his days in retirement, in the neighbourhood of Vienna, where he died in 1814. Of his works in verse and prose, there have appeared, from time to time, 30 volumes in French, of varied contents. A selection of his essays and letters has been edited by Madame de Stael. In them there is to be found much interesting information concerning persons and events; and while they everywhere display an enlightened, feeling, and penetrating mind, at the same time convey both amusement and instruction.

LIGNUMVITAE, Guaiacum. See Botany and Materia Medica.

LIGULATE is applied to such florets as compose the radial part of the daisy.

LIGURIA, in Ancient Geography, a country comprehending the greater part of the districts of Nice, Piedmont, Montferrat, Genoa, Modena, and Parma. It is said to have been overgrown with woods; and the inhabitants, a brave but wretched people, depending for subsistence principally on the chase, were subdued by the Romans.

LIGUSTRUM, Privet, a genus of plants belonging to the Diandria class. See Botany.

LIKE denotes those parts of similar curves which, reckoned from similar points, and in the same order, bear the same proportion to the whole curve, each to each. Like, or similar figures, also are such as have the same number of like parts with each other. See Mathematics.

Like Signs. Quantities which are all affirmative, or all negative, are said to have like signs. See Mathematics.

LILAWATI, a work on arithmetic and geometry, held in high estimation among the astronomers, or rather astrologers, of Hindoostan. It was written in Sanscrit by Baschara Acharya, who was a native of the Deccan, and born in 1114. This curious performance is remarkably concise and obscure, and the rules are given in verse. It was first known to Europeans from a Persian translation undertaken in 1587; and a translation of a copy, written at Guzerat, in 1673, was published by Dr John Taylor at Bombay in 1816. Of this translation a copy is deposited in the library of Exeter college, Oxford.

LILIUM, Lily, a genus of plants belonging to the Hexandria class. See Botany.

LILIACEOUS is applied to such flowers as resemble the lily.

LILLO, George, a dramatic writer, was born in the vicinity of London in 1693, and died in 1739. He was bred a jeweller, but devoted himself to the muses. Being himself an excellent moral man, his dramatic compositions not only favour virtue, but religion also. He wrote George Barnwell, and other tragedies.

LILY, William, a celebrated grammarian, and remarkable as the first who taught Greek in London, was born in 1466, and educated at Magdalene college, Oxford, where he took his degree of batchelor of arts. Lily was the first master of St Paul's school, which was founded in 1510; and he held this situation twelve years, when he died of the plague in 1523. His celebrated work, "Brevissima Institutio, seu Ratio Grammatices cognoscendæ," has gone through many editions, and is generally called Lily's Grammar. The English Rudiments were prepared by Dr Collet, dean of St Pauls, and prefaced by Cardinal Wolsey.

LIMA, the capital of Peru, situated in a delightful valley, is of a triangular form, and defended by a brick wall, which has seven gates, and is flanked with bastions. The squares and streets are regular and spacious, and the houses are generally one story high, and covered with fine mats or beautiful cotton cloth, and shaded from the sun by trees. A beautiful stone bridge over the river Lima forms the entrance to the city in the direction of the grand square, which is remarkable for a highly ornamented fountain of bronze, surrounded by twenty-four pieces of artillery and sixteen iron chains, through which the inhabitants have access by a small space. The want of rain is supplied by the river, branches of which flow in different directions through the city. The cathedral, churches, and convents are exceedingly rich. In this city are the courts of the Viceroy, the Archbishop, the Inquisition, the Crusado, and the Wills; also a university, a royal mint, and a theatre for the exhibition of bull-fights. The population is estimated at 54,000. Gunpowder is the principal manufacture, but commerce is very considerable. Luxury and superstition characterise the inhabitants. This city was visited with a destructive earthquake in 1746. It is an archbishop's see, and the residence of the viceroys of Peru.

The province of Lima is the principal audience of Peru, and bounded on the north by Quito, on the east by the Andes, on the south by the audience of Charcas, and on the west by the Pacific ocean. It has one archbishopric and four bishoprics.

LIMAX, the slug, or naked snail, a genus of worms of the order Mollusca. See Helminthology.

LIMB, the extremities of the body, as the arms or legs. See Anatomy. The term is also used in a general sense for the border or edge of a thing, as the limb of a quadrant, of the sun, &c.

LIMBERS, a machine attached to a cannon to draw it from place to place. See War, and Mechanics.

LIMBORCH, Philip, an eminent Dutch divine, was born at Amsterdam in 1633; and having undergone the usual course of studies, he became a preacher at Haerlem in 1655. He was some time minister of Goudja, but settling in his native place, he obtained the professorship of divinity, which he retained till his death in 1712. He wrote a History of the Inquisition, which has been translated into English, a System of Theology, and some other works.

LIMBURG, a province of the Netherlands, 42 miles in length and 30 in breadth, is bounded on the north and east by the duchy of Juliers, on the south by Luxemburgh, and on the west by the territory of Liege. The breed of cattle is excellent, and mines of iron and lead are worked.

Limburg, the capital, is situated near the river Wese, is a manufacturing place, and famous for fine cheese. It has a castle built of marble. There are quarries of marble in the neighbourhood, as also mines of calamine and coal.

LIME, an earthy substance universally distributed in nature. Common lime-stone is greyish or bluish, and is prepared by calcination. See Geology.

LIME-TREE, Citrus. See Botany.

LIMERICK, a fertile county of Ireland, in the province of Munster, is about 45 miles in length and 23 in breadth, and bounded by Clare on the north, by Tipperary on the east, by Cork on the south, and by Kerry on the west. It contains a population of 170,000, and sends three members to Parliament. The Shannon and the Maig are the principal rivers.

Limerick, the capital, consists of Englishtown and Irishtown, which are connected by a bridge across the Shannon, and also a respectable new quarter erected by Lord Perry, and bearing his name. It contains many elegant public buildings, besides the cathedral and several churches. The inhabitants, amounting to about 50,000, are chiefly occupied in the manufacture of linen, woollen-stuffs, and paper. They also export a considerable quantity of provisions, and are famous for the manufacture of gloves.

LIMIT, a determinate quantity, to which a variable quantity continually approaches, without the possibility of exceeding or going beyond it. See Mathematics.

Limit of Distinct Vision. See Optics.

Limit of a Planet, the point of its greatest latitude. See Astronomy.

LIMITATION, the period prescribed by statute within which an action must be brought. See Law.

LIMITED PROBLEM, a problem that admits of but one solution, as is that wherein it is required to describe a circle through three given points not placed in the same straight line. See Mathematics.

LIMOGES, the capital of the department of Upper Vienne in France, is a bishop's see, with a population of 20,000, and carries on considerable trade.

LIMOSIN, a province of France, forming the department of Upper Vienne, is bounded on the north by Marche, on the east by Auvergne, on the south by Quercy, and on the west by Perigord and Angoumois. It contains forests of chesnut trees, mines of lead, tin, copper, and iron, and an excellent breed of cattle and horses.

LIMPET, Patella. See Conchology.

LINCOLNSHIRE, a maritime county of England, bounded on the north by Yorkshire, on the east by the German ocean, on the south by Cambridge and Northampton, and on the west by the counties of Liecester and Nottingham, is about 77 miles in length and 45 in breadth, and contains an area of 1,783,680 acres. The population in 1811 was 237,891. This county consists of three districts, Holland, Kesteven, and Lindsey. The fens occupying the south-east part of the county are now rendered subservient to the purposes of agriculture; and the soil in the south and north parts is very fertile in corn and pasture. This county bears evident marks of encroachments from the sea. The coast is flat, and at low-water the sub-marine relics of a forest are seen. Great quantities of geese are bred among the fens, and on the wolds are flocks of sheep and cattle. The principal rivers are the Humber, Trent, Witham, Welland, and Ancolm; and, besides Lincoln, the towns are Boston, Stamford, Spalding, Louth, Barton, Grimsby, Gainsborough, Horncastle, and Spilsby. Lincolnshire is celebrated for its churches, which are numerous and magnificent, and adorned with spires or towers. This county sends twelve members to Parliament.

Lincoln, the capital of the county, is well built, and seated on an eminence near the river Witham, which communicates with the Trent by a canal. It is a bishop's see, and contains a population of about 9000. The chief trade is in coal, and a manufactory of camlets is also established in the town. The cathedral of this place is finely situated, and justly admired for richness of architecture. Newport-gate, which was built by the Romans, is yet entire, besides which the ruins of a castle, and of numerous religious houses, are worthy of notice. Lincoln gives the title of earl to the family of Clinton.

LINDAU, formerly a free imperial city in Swabia, situated on three islands in the lake of Constance, the largest of which is united to the main land by a bridge, 290 paces in length. On the smallest there is nothing but vineyards, gardens, and the huts of fishermen. The number of inhabitants in 1804, was 5000, occupying 700 houses; but, in 1807, they had decreased about one half, and amounted to not more than 2,700, of which the majority belong to the Lutheran church. The trade with Italy is considerable. The chief produce is wine and fruit. It possessed a rich nunnery for the daughters of noble families, whose abbess in former times had the rank of princess; but this endowment, with the town, was in 1802 given as a compensation to the prince of Bretzenheim, by whom it was ceded to Austria in 1803, and by the latter again, in 1806, to the King of Bavaria, with whom it now remains, and forms part of the district of the Iller.

LINDSEY, Theophilus, a native of Middlewich in Cheshire, was born in 1723, and educated at the grammar-school of his native place, whence at the age of 18 he was removed to St John's college, Cambridge, for the completion of his studies. Having taken orders, he was appointed to a chapel in Spittal square, London; and two years after he became domestic chaplain to the duke of Somerset. At the suggestion of the duchess he accompanied her grandson to the south of France for the recovery of his health, and on his return, through the duke's interest, he obtained a temporary living at Kirkby in the north of England, where he became intimate with Archdeacon Blackburne. He next obtained the living of Piddletown in Dorsetshire, which in 1764 he resigned for that of Catterick in Yorkshire. In 1771 Mr Lindsey co-operated with Archdeacon Blackburne and others, to obtain relief from the subscription of the Thirty-nine Articles; and when the dissenters petitioned Parliament for the extension of their privileges, he evinced much zeal in the cause. About this time motives of conscience induced him to think of leaving the communion of the church of England; and in 1773 he accordingly gave in his resignation to the prelate of his diocese. He now removed to London, and by the patronage of friends was soon enabled to open an Unitarian chapel. Being settled in London, he published his "Apology," which was followed by "A Sequel;" and in 1802 appeared his "Conversations on the Divine Government, shewing that every thing is from God, and for good to all." He died in 1808.

LINE, a magnitude which has length only, without breadth or thickness. See Mathematics.

Line, among artists, signifies the twelfth part of an inch. The term is also of frequent use in astronomy, geography, and navigation.

Line, in fortification, is a ditch bordered with a parapet, intended for a defence against the enemy. See War.

LINEAMENT denotes the outlines of the features. See Design.

LINEAR, in mensuration, applies to numbers expressing length only. A linear problem is one that can be solved by the intersection of two right lines, and admits of one solution only. See Mathematics.

LINEN is a kind of cloth manufactured from flax or hemp; the knowledge of which was derived from the Egyptians, and introduced into Britain at the first settlement of the Romans. Linen is the staple commodity of Ireland, but this manufacture is also improving considerably in Scotland. For the encouragement of the linen trade, all foreign linen, for home consumption, pays a duty.

LING, a species of fish of the genus Gadus. See Ichthyology.

LINGUET, Simon Nicolas Henri, born 14th July 1736, at Rheims, distinguished himself in Paris as an advocate of great talents, independent character, and commanding eloquence. Having, by several eminent defences, drawn down upon himself the hatred of his opponents, and the envy of his colleagues, 24 of the latter shewed the meanness of their jealousy, by entering into a resolution not to act with him for the space of a year, and the parliament of Paris soon after interdicted his practice altogether. He now wrote a political journal, which, if it increased the number of his admirers, strengthened also the ranks of his enemies, and it was at last suppressed by the government. Fearing for his personal safety, he retired first to Switzerland, then went over Holland to England, and after a short stay repaired to Brussels. Having obtained permission from the Count Vergennes, he returned to Paris, but the clamour being renewed against him, he was thrown into the Bastile, where he remained for two years. Liberated in May 1782, he made another journey to England, and then settled in Brussels, where he edited a journal, with the title Anales Politiques, which, being written in a lively, engaging style, and with great freedom of remark, had an extensive circulation. He returned finally to Paris in 1791, and fell a sacrifice to the guillotine, during the reign of terror, 1794. The most remarkable of his works are, "*Histoire des Revolutions de l'Empire Romain*," 2 volumes 12mo, and "*Memoirs sur la Bastile*," London 1783.

LINIMENT, an unctuous medicine, applied externally, to soften the skin and resolve the humours that afflict the patient. See *Pharmacy* under Materia Medica.

LINLITHGOWSHIRE, or West-Lothian, a county of Scotland, bounded on the north by the frith of Forth, on the south-west by the county of Lanark, on the south-east by Mid-Lothian, and on the north-west by Stirling, is about twenty miles in length and twelve in breadth, and abounds in corn and pasturage, as well as coal, lime-stone, and lead-ore. This county is finely diversified and well watered. It consists of thirteen parishes. The population exceeds 19,450. In Torphichen parish some Druidical monuments still remain.

Linlithgow, the capital of Linlithgowshire, and a royal burgh, stands in a pleasant part of the country, and consists of one open street about a mile in length. The remains of the palace are worthy of notice. The aisle of St Michael's church is still shewn, in which James IV. is said to have seen an apparition which warned him of his fate at the battle of Flodden; and the house is also pointed out from which the regent Murray was shot. An elegant fountain, with eight spouts, and surmounted with an imperial crown, adorns the market place. The inhabitants exceed 4000, and are occupied in the manufacture of leather, and in making of shoes. Linlithgow is united with Selkirk, Peebles, and Lanark in the election of a representative in Parliament.

LINNÆUS, Charles, a distinguished botanist, was born in the village of Nushult, province of Smaland in Sweden, where his father was clergyman. His father, in consequence of a vow, destined him also for the pastoral office, and being himself passionately fond of botany, the son had, from his earliest years, an opportunity of acquiring a knowledge of plants, and of forming a taste for the science. When in his tenth year, he was sent to school at Wexis; but shewed so much indifference, and total want of application, that his masters, after some time, thought it necessary to apprise the father of the youth's incapacity, and gave it as their opinion, that, since he seemed to have no farther ambition than to gather flowers and to catch butterflies, he was fit for nothing better than a mechanic. The father, though, no doubt, disappointed, held this to be decisive of his son's destiny, and sent him to be apprentice to a shoemaker. He had not been long here, however, when the physician Rothman, who was possessed of more penetration than the pedagogues, remarked Linnæus's talents, and represented to his parents, that, in all probability, a false estimate of their son's capacity had been formed, and that, from what he had observed, they might, at least in so far, keep their vow, by consecrating him a priest of nature. This advice was adopted, and the future benefactor of science was released from the labours of the stall. By this gentleman he was furnished with Tournefort's Institutes, which was the first scientific work on botany he had an opportunity of perusing. Having great difficulties to cope with, and finding that botany afforded him but little prospect of obtaining a suitable provsion for life, he resolved to supply the deficiency by a medical education, and with that view repaired to the university at Lund. Some years afterwards, on visiting the botanic garden at Upsal, he accidentally attracted the notice of Celsius, who was astonished at the extent of his knowledge; and, being then engaged in preparing a work on the plants mentioned in the Bible, took Linnæus into his house as an assistant. Here he hit upon the happy idea, that the sexual parts of flowers might be made available for the purpose of classification, and communicated his thoughts, in the form of an essay, to Rudbeck, the professor of botany. Rudbeck, struck with the novelty and ingenuity it displayed, appointed him, in consequence, to give the demonstrations in the botanical garden; and shortly after recommended him as a proper person to make a botanical excursion to Lapland, then in contemplation. This journey he actually performed in the summer 1732, and in 1735 laid the important result before the public, in his "Complete Flora of Lapland," which has since served as a model for all similar works, and in which the number of the stamina, and their relation to the pistil, and to each other, was first applied as the principle of arrangement. In this journey he met with great abundance of the elegant plant which now bears his name. To attain greater knowledge in his profession, he went in 1735 to Leyden, to complete his studies under Boerhaave and Gronovius, with whom he entered into the closest friendship. Here he published his "System of Nature" in a tabular form, which contains the ground-work of his fame, and forms an era in the science of botany. In many species, which he had not himself an opportunity of examining, he followed Tournefort; but, on farther investigation, had to retract much of what had been advanced on his authority. Recommended by Boerhaave and Burmann to Clifford, a rich East India merchant, who wanted a domestic physician who might at the same time superintend his rich and extensive garden at Hartecamp near Haerlem, he entered into his service in 1736, and, for the space of a year and a-half, enjoyed the best opportunities for continuing his favourite pursuits. His *Systema Naturae* 1735, was followed, in 1736, by his *Fundamenta Botanica,* to which he afterwards gave a commentary in his *Philosophia Botanica.* In the same year appeared his *Bibliotheca Botanica,* and in 1757 his costly and elegant work *Hortus Cliffortianus.* Thereafter appeared his *Genera Plantarum,* in which 935 species are ascertained, though, from the inaccuracy of his sources, many of the characters are doubtful. Under the title *Critica Botanica,* he gave an explanation of aphorisms contained in the *Fundamenta Botanica;* and, lastly, appeared also in 1737 his *Classes Plantarum,* embracing all the systems at that time known. During his residence at Hartecamp, he had an opportunity of paying a visit to England; and when it is remembered that all this was accomplished in the short space of less than three years, one must equally admire the successful exertion of his talents, and his indefatigable industry. In 1738 he set out on his return to Sweden, by way of Paris, where he became acquainted with Jussien, Guettard, and other botanists of eminence, and in September arrived at Stockholm. Here he commenced practice as a physician, under great discouragements; but his successful treatment of diseases of the breast having transpired at court, he was called in to attend the queen, and henceforth the richest patients flocked to him from all quarters. He was appointed physician to the admiralty, and royal botanist. In 1741 it was resolved, by the assembly of the States, to add to the knowledge of natural history by a scientific tour into different parts of the kingdom, and Linnæus was selected to conduct the enterprise. Of this journey he published an account in 1745. However agreeable his situation in Stockholm might be, he longed to be enabled to devote himself exclusively to his favourite pursuits; and in 1742 he obtained the object of his wishes, in being appointed professor of botany at Upsal. Here his first care was to arrange and improve the garden, of which he published a description in 1748, under the title of *Hortus Upsaliensis.* In 1765 appeared his *Flora Suecica,* to which succeeded *Fauna Suecica.* Besides superintending editions of his earlier works, he wrote in Upsal nearly 200 academical treatises, a great number of dissertations for the Stockholm academy, the Literary society of Upsal, the Academy of Petersburgh, and the Royal society of London. He paid, in particular, unremitting attention to the improvement and completion of his principal works, the *Species Plantarum, Philosophia Botanica,* and *Materia Medica.* Feeling the approach of the infirmities of age, he gave in his resignation in 1772, which his majesty refused to accept in very flattering terms, and made him a present of an estate, with permission to reside there as often as he thought proper. He was struck with palsy in 1774, which, two years afterwards, returned, and left behind a melancholy weakness of mind and body, till he was released by death on the 10th of January 1778. He united an extraordinary degree of penetration with clearness and precision, original talent with unremitting perseverance; and has left a name honoured and revered in every country where science is cultivated and worth held in estimation.

LINNET, FRINGILLA. See ORNITHOLOGY.

LINSEED the seed of the plant *Linum,* much used in medicine. By compression it yields an oil which is of use in painting, and the cakes which remain are of value in farming.

LINSTOCK, a staff about three feet long, one end of which is stuck in the ground, or in the deck of a ship, and the other is used for keeping the match dry, and ready for firing. See WAR.

LINT, the flax of which linen is made. It also denotes the scrapings of fine linen, made up in different forms, and used in the dressing of wounds.

LINTEL, a piece of timber lying horizontally over door-posts or window jambs. See ARCHITECTURE.

LINTH, a river in Swisserland, which has given occasion to one of the greatest undertakings in modern times. The circumstances are the following. The lakes of Zurich and Wallenstadt were originally only one. The Linth, descending with impetuosity from Glacus, entered it on one side; and since the stream carries with it immense deposits from the upper regions, the bed of the lake was gradually filled up, so as to divide it into two, and a large valley formed between them. As this process continued, the bed of the Maag, which now formed the outlet of the upper lake, was elevated ten feet. In consequence the towns of Wesen at the lower, and Wallenstadt at the opposite end, were laid under water, and the whole of the intervening country converted into a morass, whose exhalations generated malignant fevers, which extended their ravages almost as far as Zurich. Five thousand acres of field and meadow were swallowed up and rendered useless, and the whole country was about to be deserted. To strike at the root of this evil, it was proposed by Escher to bring the Linth to discharge its waters into the lake of Wallenstadt, by cutting a new bed through the rocks. This recommendation was adopted by the house of assembly in 1805. A commission was appointed, with him at its head; the Herculean undertaking was commenced and accomplished. The Linth now deposits the spoils of the higher country in the lake, whence it issues as a pure stream; the bed of the Maag was again deepened, and the fields and meadows rescued from the watery element. The expense, amounting to between 30 and 40,000 pounds Sterling, was defrayed by shares of 50 francs, which are covered by the sale of the recovered lands, and by a tax on those which have been saved from farther encroachment.

LINUM, FLAX, a genus of plants belonging to the Pentandria class. See BOTANY.

LINUS, one of the most ancient poets and musicians of Greece. He is said to have flourished 1280 years before Christ, and to have been the inventor of verses and music among the Greeks.

LION, FELIS. See MAMMALIA.

LINZ, a fortified city of Upper Austria, situated at the conflux of the Traun and Danube, with a bridge of stone over the latter 400 paces long. The houses, externally of a good appearance, are, for the most part, covered with shingles. The number of inhabitants, exclusive of military, amounts to 16 or 17,000. The woollen manufacture is the most important in the Austrian dominions, particularly for excellent carpets, and gives employment to a great number of individuals in the town and surrounding country. There is also a manufactory of gunpowder, and several other wares, which render it a place of considerable trade. In 1784 it was erected into a bishopric; and the Lyceum established by Landolph I. in 1676, has the right of conferring the degrees of bachelor and master of arts, but it has never exercised this privilege.

LIPARI ISLANDS, a group of islands in the Mediterranean, off the north coast of Sicily, amounting in all to eleven; the principal of which are Lipari, (which gives its name to the others,) Volcano, Salini, Panaria, Stromboli, Alicudi, and Felicudi. They appear to have owed their origin to subterraneous fire; and this may account for the fiction which represented them as Vulcan's work-shop, and as the abode of Æolus, from whom they were formerly named. Lipari has a small, ill built town, of the same name, which is the seat of a bishopric. The number of inhabitants on the whole island does not exceed 14,000. Of the excellent Malvasian wine, which is here produced, there are about 200 barrels exported yearly. The Campo Bianco, a high conical hill, is formed by layers of whitish pumice-stone, which is here a considerable article of commerce. The trade in raisins and figs is also very considerable. In Volcano and Stromboli there are active volcanoes; the latter, in particular, ejects, at all times, quantities of fire and red hot stones, and at night may be observed at a great distance.

LIPPE, a principality in Westphalia, has long been divided between two branches of the reigning family, who take the titles of Lippe-Detmold, and Lippe-Schaumburg. 1. Lippe-Detmold, which is the elder branch, was raised to the dignity of prince of the empire in 1820. The number of inhabitants amounts to 70,540, in five cities, four market-towns, and 152 villages. Detmold, the residence, has a population of 2400 souls, and 325 houses. Lippstadt on the Lippe, belongs partly to this principality, and partly to Prussia, and has 2700 inhabitants. The reigning prince, Paul Alexander Leopold, born in 1796, on the death of his father in 1802 was left to the care of his mother, who, in his name, joined the confederation of the Rhine in 1807, but renounced it after the battle of Leipsig. The principality has one vote in the diet at Frankfort. The revenue is supposed to amount to 460,000 gueldres, and the military establishment consists of 900 men. The house of Brunswick has the expectancy of this principality. 2. The younger branch, Lippe-Schaumburg, whose representative, George Wilhelm, born 1784, was first invested with the rank and title of prince in 1807, when he joined the confederation of the Rhine. In 1810, he abolished servitude among the peasants of his estates. The number of inhabitants amounts to 23,700, and Buckeburg is the residence. The revenue may be computed at 215,000 gueldres, and the military amount to 400. This principality has also a vote in the diet; and the principalities of Hohenzollum, Liechtenstein, Reuss, Lippe-Detmold, Lippe-Schaumburg, and Waldeck unite in sending a delegate thither.

LIPS, JOHANN-HEINRICH, painter and engraver in Zurich, was a protegee of the famous Lavater, who, being apprised of his talents, rescued him from being condemned by poverty to follow his father's profession of village barber; and having procured him the means of instruction, afterwards employed him on the drawings which accompany his treatise on physiognomy. When these labours were brought to a close, Lips went to Rome, to perfect himself in his art. At his return he was called to Weimar to be professor of the academy of painting, but soon resigned his charge, and returned to his native country. His numerous engravings have been distributed all over Europe, and shew him to have been an artist of great merit in this department. He has been some time dead.

LIPSIUS, a distinguished philologist and critic, was born, 1547, near Brussels. Having received the preparatory instruction from the Jesuits in Cologne, he went to the university of Louvain, where, though the law formed his professional study, he shewed a peculiar predilection for the classics. The first fruits of these early studies were his *Variarum Lectionum Libri tres*, which he dedicated to his protector, Cardinal Granvilla, who, on his visiting Rome, 1567, took him into his house, and made him his Latin secretary. Here he had an opportunity of comparing the manuscripts in the Vatican and other libraries, of studying the antiquities of Rome, and enjoying the society of men the most distinguished for learning. After various wanderings, and having been some time professor in Jena, though a Protestant university, he repaired, in 1574, to Cologne, where he wrote his *Antiquæ Lectiones*, and began his annotation on *Tacitus*. Having become doctor of laws at Louvain, he commenced lecturing; but being disturbed by the war then raging, he accepted of the chair of history at Leyden, and at the same time embraced the Protestant religion. During the 13 years he remained here, he wrote his principal works on critical, historical, and philosophical subjects, which are all distinguished by great erudition; his commentary on Tacitus, in particular, has been highly esteemed. His treatises, however, *De una Religione*, and his *Politicorum, Libri 5.* involved him in such violent disputes that he found it prudent to leave Leyden, and, renouncing the Protestant religion, settled again at Louvain, where he read lectures with great applause. He died here in 1606. His works have appeared in six folio volumes. Among Roman authors, he has commented Plautus, Tacitus, Valerius Maximus, Velleius Paterculus, and Seneca.

LIQUEFACTION, the act of melting; and bodies that melt are denominated liquefiable, or liquescent. See Chemistry.

LIQUID, a substance which gives the idea of moisture, as water; while air, ether, mercury, smoke, flame, metals in a state of fusion, are fluids, but not liquids. See Chemistry and Hydrostatics.

LIQUORICE, the inspissated juice of the common liquorice root. See Materia Medica.

LISBON, (Lat. 38° 42′, Lon. 9° 4′ W.) the capital of Portugal, in the province of Estremadura. It stands on the right bank of the Tagus, and has a commanding situation on three hills, surrounded by beautiful and romantic scenery. It consists of three grand divisions, Alfama, Bairro alto, and o Mejo, which, together, contain 40 parishes, 44,000 houses, and 300,000 inhabitants, among which are included many negroes, mulattoes, creoles, and 30,000 Gallegoes, or Gallicians, who come hither to find employment as porters and water-carriers. The city is entirely without defences; but the harbour, which is at once commodious and secure, is defended by several strong forts. The west part of the town, o Mejo, has been built since the dreadful earthquake in 1755, which laid half of the city in ruins, and the streets are regular and spacious: the old part, on the contrary, which was left standing, is gloomy, dirty, and inconvenient. That part which lies along the Tagus has a noble appearance. Among the public buildings, the place of commerce and the Rocio are the most conspicuous. The former, situated at the landing place, is large, and adorned with fine buildings on three sides, the fourth being open towards the river. In the centre is a statue of Joseph I. in bronze. In the other the Autos da Fé were formerly exhibited, and one side is entirely occupied by the buildings of the Inquisition, in modern taste. Ten streets branch out from it in all directions. Among the great number of churches, the new church, built since the restoration of the city, is by far the most splendid, and is distinguished for architectural beauty. The Patriarchal church, situated on an eminence, whence there is a variegated and extensive prospect, is internally very magnificent, and contains treasures and gems of great value. Lisbon was formerly notorious for the filth and insecurity of the streets; and although much has lately been done to remedy these evils, there is still great room for improvement. In some quarters nastiness still prevails, and the passenger is every where annoyed by a countless number of emaciated dogs, which prowl about without owners; nor are the streets, in the night, entirely free from cowardly assassins. Among the curiosities of Lisbon is the aqueduct which conveys water into the city across the vale of Alcantara, supported by 35 bold arches, which, in one place, are so lofty that a ship of water under full sail might pass beneath. It resisted the effects of the great earthquake, although the key-stones are observed to have descended several inches, but were held fast by the closing of the arches. There is a large hospital for the cure of diseases, and another for foundlings, where about 1600 children yearly are received. Of literary institutions, it has an academy of sciences, a college for the education of the young nobility, a seminary for cadets in the sea and engineer service, a botanical garden, an observatory, a royal cabinet of natural history, and, besides several public collections, the royal library, of 80,000 volumes. There are few manufactures, but the commerce and navigation are extensive, and Lisbon is reckoned one of the greatest marts in Europe.

LISBURN, a borough town in the county of Antrim, in Ireland, situated on the river Laggan; is well built, and carries on extensive manufactures of linen, muslin, and cambric. It contains a population of 5000, and sends one member to Parliament. The places of worship are numerous.

LISIEUX, a trading town in the department of Calvados in France. It is seated on the Tongue, and contains a population of about 10,000.

LISLE, formerly the capital of French Flanders; stands on the river Doyle, and contains 11,300 houses, with nearly 60,000 inhabitants. It is one of the strongest fortresses in Europe, particularly the citadel, on which Vauban expended all the resources of his art. There are many beautiful and splendid public buildings, among which may be reckoned the churches of St Stephen and St Peter, the town-house, the corn-market, the great hospital, the theatre, the armoury, and the main-guard. There is also an exchange, a mint, a society of fine arts, an academy for drawing and painting, a public library, a botanical garden, a gallery of pictures, and important manufactures of woollen, linen, lace, cotton, tobacco, leather, glass, Delftware, large establishments for cotton-spinning and printing, and excellent bleachfields. Around the city there are more than a hundred oil mills. It has a brisk trade in flower roots, especially tulips, in which it rivals Haarlem. It was taken by Prince Eugene in 1708, after a protracted defence, but restored at the peace of Utrecht. In 1793, the Austrians bombarded it without success. Lisle is the principal town of the department of the North, and the seat of a tribunal for commerce, and the head-quarters of the 16th military division.

LISLE, Joseph Nicholas De, an eminent French astronomer, was born in 1688 at Paris, where also he was educated, and where he was led to commence the study of astronomy, in consequence of a total eclipse of the sun, which occurred in March 1706. At the age of twenty-one, he was considered an able astronomer; but was indebted for the means of support chiefly to his skill in judicial astrology. In 1715, he calculated tables of the moon according to the Newtonian theory, and was allowed a pension of 600 livres. In 1720, he gave in a proposal to the academy of Sciences, of which he was now a member, to ascertain in France the figure of the earth, which was afterwards carried into effect. Repairing to England in 1724, De Lisle obtained the approbation of Newton and Halley, and was elected a member of the Royal society. He was invited to Petersburg in 1726, where he continued in the capacity of astronomer-royal for 21 years, when he returned to Paris, and was appointed professor of mathematics in the College-royal. In 1753, De Lisle published a map of the world, representing the effect of Mercury's parallaxes in different countries, and endeavoured to determine the diameter of the sun. He corrected the double error of Halley respecting the transit of Venus, and thus superseded the necessity of many voyages of learned men to observe it. The office of astronomical-geographer was held by him for some years previous to his retirement to the abbey of St Genevieve in 1758. This great astronomer was connected with every literary society in Europe. He died in 1768, in the eighty-first year of his age.

LISMORE, one of the western islands of Scotland. See HEBRIDES.

LISMORE, a borough town of the county of Waterford in Ireland, situated on the river Blackwater. The principal buildings are the castle, a court-house, and the church. The castle was built by King John in 1195. It was once the property of Sir Walter Raleigh, and is remarkable for having given birth to the great philosopher Robert Boyle. The trade consists chiefly in the salmon-fishery.

LISSA, an island in the Adriatic, on the coast of Dalmatia, 30 miles in circumference, very mountainous, and but thinly inhabited. The wine of this place is the strongest any where made, besides which, fruits and honey are produced in abundance. A fishery of sardines and anchovies is carried on. Comisa, on the east side of the island, is a well built and populous town.

LIST, the border of cloth or stuff. List, in architecture, is a small square moulding accompanying larger mouldings, or separating the flutings of a column. The term list also signifies the inclosed field allotted for tournaments.

LIST, CIVIL, certain sums of money set apart for defraying expenses of the king's household, and necessary charges of government. When these expenses have exceeded the revenues appointed, application is made to Parliament to discharge the debts contracted on the civil list.

LITANY, a solemn form of supplication to the Deity, in which the priest utters some things proper to be prayed for, and the people join in their intercession.

LITCHFIELD. See LICHFIELD.

LITERAL, that branch of algebra in which all the quantities are represented by letters and symbols. See MATHEMATICS.

LITERARY JOURNALS. See JOURNALS, LITERARY and SCIENTIFIC.

LITERARY PROPERTY, or COPY-RIGHT, is that property which an author is supposed to have in his own works, and which excludes others from publishing them without his permission. The discussion on this subject is entirely of modern date.

When the knowledge of the art of printing began to spread, the early printers found it expedient to apply for the sole right of printing books of which they were the first publishers. Thus the privilege of literary property was originally granted to printers; but, in course of time, privileges were transferred to the author, though the abstract right appears not to have been legally recognised.

The right of authors, in Britain, was not determined until 1760. In 1774, it was decided that no copy-right subsists in authors after the expiration of the terms created by the act 8th Anne, c. 19. which statute farther enacts, that nine copies of each book that shall be printed or published, or printed and published with additions, shall be delivered by the printer to the warehouse-keeper of the company of stationers, before publication, for the use of the public libraries. But the last and most important statute was that of the 54th George III. c. 156. by which it is enacted, "that, from and after the passing of this act, the author of any books composed, and not printed or published, or which shall hereafter be composed, and be printed and published, and his assignee or assigns, shall have the sole liberty of printing and reprinting such book or books, for the full term of 28 years, to commence from the day of first publishing the same; and also, if the author shall be living at the end of that period, for the residue of his natural life." Besides the damages for violating the copy-right granted by this act, it also allows double costs of suit, and forfeiture of the books, and of threepence for every sheet printed and sold contrary to the intent and import of this statute; and the act further directs, that one copy of every book published shall be delivered to the British Museum, but limiting the claim of the other ten libraries only on condition of their being demanded in writing. The House of Commons, however, having been appointed to examine the copy-right acts, recommended the repeal of this statute, in so far as it requires the gratuitous delivery of eleven copies, and that the number should be restricted to five, namely, the British Museum, and the libraries of Oxford, Cambridge, Edinburgh, and Dublin universities.

LITERATI, in general, denotes learned men; and, in China, such persons as are able to read and write their language, which is extremely difficult.

LITHARGE, a preparation of lead. See CHEMISTRY.

LITHIASIS, a disorder in which hard concretions are formed in the urinary organs. See SURGERY.

LITHOGRAPHY, the art of taking impressions from a drawing or writing executed on stone. See DESIGN.

LITHOSPERMUM, GROMWELL, a genus of plants belonging to the Pentandria class. See BOTANY.

LITHOTOMY, an operation for extracting a stone from the bladder. See SURGERY.

LITHUANIA, (in the language of the country, Litwa,) was originally an independent archduchy, which became subject to Poland in 1569, and has since shared its fate. It enjoys a healthy, temperate climate, and the land, when cultivated, is highly productive. There are no ranges of mountains, nor any considerable elevations. The soil, which is partly of land and partly of clay, is diversified by marshes and forests. Among the rivers are the Duna, the Dnieper, the Niemen, the Prypiz, and the Bug. Great numbers of cattle are reared in this country; and it abounds in corn, flax, hemp, wood, honey, and wax. The forests supply plenty of game, and wolf and bear skins form an article of trade, as well as the natural productions already mentioned, of which the exports are considerable. Industry here is at a low ebb, and is confined to a few iron-works, glass-houses, tanneries, and numerous distilleries of ardent spirits called brantwein. Part of this country, now forming the governments of Polotsk, Vitepsk, and Moghilew, fell to the share of Russia in the partition of 1773; a still greater part, containing 850,000 souls, in 1793; and the remainder in 1795,—so that no part of it is now included in the kingdom of Poland properly so called. Prussia, also, in the same partition, obtained that part which now forms the district of Gumbinnen in the province of East Prussia, which is very fertile, and well cultivated.

LITMUS, a blue pigment, prepared by adding quicklime and putrified urine to ground archil; which mixture, after cooling and evaporation, assumes the consistence of a paste, and is laid on boards to dry.

LITTER, Lectica, an ancient vehicle common among the Romans, and still known in the east by the name of Palanquin. It was borne upon shafts by two, four, or any convenient number of men.

LITURGY, from the Greek, denotes the order of public worship in the Christian church as established by authority, or, in a more limited sense, the book containing the formula to be observed by the priest and clergyman officiating. The liturgy in the Catholic church is principally the work of Gregory I. who fixed it definitively in the canon of the mass, and regulated the singing. The breviary and missal were, and are always used in Latin, and include invocations to saints, adoration of the host, images, &c. which could not be adopted by the Protestant churches, being accounted superstitious and profane. In England, the first steps towards the introduction of the present liturgy were made in the reign of Henry VIII. who caused some parts of the Romish ritual to be translated into English, and excluded others. In order to introduce a more thorough reformation, a committee of divines was appointed in the first year of Edward VI. at the head of which was the excellent Cranmer, to draw up a more approved form of worship, which, in the following year. 1548, was adopted by the king and both houses of Parliament. This underwent, afterwards, several revisals, and was finally sanctioned as it now stands, by the clergy in convocation, 20th December 1661, and in March following ratified and confirmed by both houses of Parliament.

LIVADIA, a province of Turkey in Europe, bounded on the north by Epirus and Thessaly, on the east by the Archipelago, on the south by the gulf of Egina, and on the west by the Ionian sea; is about 180 miles in length and 36 in breadth, and contains what is properly called Ancient Greece. See Greece.

Livadia, the capital of the province of the same name, is situated on the gulf of Lepanto, and was anciently celebrated for the oracle of Trophonius. The trade consists in woollen stuffs and rice.

LIVER, the largest gland in the body, and which performs the secretion of the bile. See Anatomy.

LIVERPOOL. See Lancashire.

LIVERY, a distinguishing colour or form of dress for gentlemen's servants. At tournaments, the ancient cavaliers wore the liveries of their mistresses. In the Romish church, liveries are, white for confessors and virgins, black for the dead, red for the apostles and martyrs, and blue for penitents.

LIVERY of Seisin, the delivering of lands to the proper person; but, since the making the statute of uses, lease and release is substituted.

LIVERYMEN, of London, are freemen chosen from each company, out of which the common council, sheriff, and other officers are elected for the government of the city, and these only have the right of voting for members of Parliament.

LIVIA, Drusilla, wife of the Emperor Augustus, was the daughter of Livius Drusus Claudianus, who fell in the battle of Philippi, fighting by the side of Brutus and Cassius. She was first married to Tiberius Claudianus Nero, by whom she had two sons, Drusus and Tiberius. When her husband became reconciled to the triumvirate, she left Anthony, with whom she had taken refuge in Achaia, and came to Rome, where her charms made so deep an impression upon Augustus, that he became passionately enamoured of her, divorced his wife Scribonia, A. U. C. 71, and carried her off from her husband in a state of pregnancy. Livia now acted her part with great address, and so skilfully employed the ascendancy she had acquired in the fartherance of her ambitious projects, that she secured the succession to one of her sons. To accomplish this object, she found means to remove all those out of the way who might oppose her plans, or have nearer claims to the purple. By her interference, Julia, the only daughter of Augustus, was banished. The Roman historians almost uniformly ascribe to her the death of the young Marcellus, of Lucius Cæsar, and the banishment of Agrippa Posthumus. The emperor, now that he had no nearer relation, was easily prevailed on to crown her wishes by assenting to the advancement of her son Tiberius, who, accordingly, succeeded him in the empire. In the will of the emperor, Livia was declared his first heir, adopted into the Julian family, and honoured with the name of Augusta. She was also made high-priestess in the temple of her deified husband, and coins were struck to her honour. Tiberius, who owed every thing to her affection, treated her with great ingratitude, prohibited the senate from decreeing her farther honours, and, when he at last retired from Rome to devote himself entirely to his lusts, he came to an open breach with her, refused to see her in her last illness, and expressly forbade divine honours to be paid to her memory.

LIVONIA, a province of the Russian empire, bounded on the north by the gulf of Finland, on the west by the Baltic, on the south by Poland, and on the east by Novogorod; is about 190 miles in length, and 180 in breadth, and is remarkably fertile in corn. It has several convenient harbours, and exports flax, hemp, wax, leather, and potash.

LIVRE, a French coin equal to 20 sous.

LIVY, Livius Titus, the celebrated Latin historian, descended of an illustrious family at Padua, having repaired to Rome at an early period of life, he was introduced to Augustus, who knew how to appreciate and direct his uncommon talents, and who supplied him with materials for his Roman History, a work of distinguished excellence, which has transmitted his name and reputation to modern times. After the decease of Augustus, he returned to his native city, where he expired on the same day with Ovid, and in the 70th year of his age, in the fourth year of the reign of Tiberius Cæsar. This great historical work has been universally admired. It commences with the foundation of the city, and extends to the death of Drusus in Germany. Originally it consisted of 142 books, of which only 35 have been preserved, and even of these some are imperfect. The learned have long regretted the mutilated state in which the works of this eminent writer have reached us, but the books that were lost have at length been supplied by Freinshemius. The best editions of his works are those of Le Clerk, Amst. 1709, and of Drakenborch, Amst. 1738, seven volumes; also of Gronovius, *cum notis variorum*, three volumes, Lug. Bat. 1679.

LIXIVIUM, a ley obtained from the pouring of water upon burnt vegetables. See CHEMISTRY.

LIZARD, LACERTA, a genus of amphibious animals. See ERPETOLOGY.

LIZARD, LACERTA, one of the new constellations of the northern hemisphere. See ASTRONOMY.

LIZARD-POINT, the most southern promontory of England, whence ships depart for the westward. See CORNWALL.

LLANDAFF, a town of Glamorganshire. See GLAMORGANSHIRE.

LOADSTONE, a substance resembling iron ore, and highly valuable for its peculiar properties. See GEOLOGY and MAGNETISM.

LOAM, an earth composed of sand and a tough viscid clay, which, when moistened and worked, is employed as a mortar in the erection of furnaces. In chemistry it is mixed with borax, and forms an excellent lute.

LOAN is a term applied to the revenue, to express the sums borrowed by government, from time to time, to supply the exigencies of the state, and the interest of which is paid annually by the public taxes. See FUND and TAXES.

LOANGO, a kingdom on the western coast of Africa, extending 100 leagues along the coast, and about 70 leagues inland. The climate is remarkably warm, and the soil fertile. Though the climate of this country seems to be insalubrious to foreigners, the natives are generally healthy. Among the inhabitants is that singular race the Albinos, already described, (See ALBINO.) The productions consist of grain, tobacco, cotton, pepper, pimento, sugar, fruits, and palm wine. Fish is plentiful in the lakes and rivers. Hogs, pheasants, and partridges, are found in abundance; and among the wild animals are elephants, lions, leopards, tigers, and wolves. A variety of serpents infest the country, as also prodigious swarms of venomous insects. The hunting of the elephant, zebra, and leopard, is countenanced by the king of the country in person. In fishing they make use of mats of about 300 yards in length, made of rushes, which floating upon the water with rushes suspended from the sides, terrify the fish, and cause them to leap out of the water upon the mats, when they are caught. The natives likewise succeed in fishing by means of a large amphibious animal called the *emboak*, or sea-dog, which, in pursuing his prey along the shore, drives shoals of small fish before him, which become an easy prey.

The arts are comparatively little known in Loango, the inhabitants being remarkably indolent and averse to labour. The slave trade was formerly carried on here to a great extent, but is now happily abolished. There is a considerable traffic, however, in logwood, ivory, and skins. Metals are produced in abundance, but the natives cannot refine them; and their money consists of pieces of cloth of their own weaving. Their dress is made of the leaves of the palm or banana trees. The garments, thus formed, they bind by a girdle round the waist, and adorn themselves, moreover, with feathers, shells, and beads of ivory and coral. To each other the inhabitants are in general friendly, but often jealous and revengeful. Polygamy is encouraged, and the women, doomed to every servile employment, are subjected to the greatest toil, and often wretchedness. Their laws are more mild and salutary than those of their neighbours, although their execution depends solely on the will of the sovereign. Murder is always punished with death; and the thief, if he cannot restore what was stolen, is publicly exposed to the contempt and derision of the spectators, with his hands tied behind him. In the case of a bankrupt who absconds, the relations are made responsible for the debt. To strangers they deny the rite of sepulture. The king's revenue consists of slaves, elephants teeth, and copper. This country was formerly a part of the great kingdom of Congo; but, after a sanguinary war, its independence was established.

Loango, the capital, situated about a league and a half from the sea coast, is the residence of the king, whose palace forms a spacious square, surrounded by trees, in the centre of the city. The streets are wide, and lined with bananas and other trees. The trade is considerable.

LOBBY, a small waiting-room, or entrance into a principal apartment.

LOBE denotes the parts of which the lungs consist, and applies also to the divisions of the liver. See ANATOMY.

LOBSTER. See *Cancer*—ENTOMOLOGY.

LOCAL PROBLEM, a problem admitting of a variety of solutions. It is said to be simple when the point sought is a right line; plane, when this point is in the circumference of a circle; solid, when it is in the curve of a conic section; and sursolid, when it is in a curve of the higher orders.

LOCARNO, a town of Switzerland in the canton of Tesino, is situated about a quarter of a mile from the Lago Maggiore, which formerly bathed its walls. It is well built and sheltered, and the climate is mild and agreeable.

LOCHABER, a mountainous district of the county of Inverness, extends about 20 miles from east to west, and 30 from north to south, and is very sterile. Fort-William, with the town of Maryburgh, is situated near the mouth of the river Aber.

LOCI, or LOCUS. See *Geometry* in MATHEMATICS.

LOCK, a piece of mechanism, composed of springs and bolts, used for the purpose of securing doors or chests. As the most valuable property often depends for its protection upon this contrivance, it has long been the object of the most ingenious locksmiths to discover a mode by which the pick-lock can be effectually excluded, and, by means of the intervening wards and springs, to throw such impediments in the way as shall effectually prevent the access of any key but its own. Some have, consequently, been so ingeniously contrived, as completely to prevent the successful application of the pick-lock; but no contrivance has yet been discovered that can exclude the admission of a false key and every other instrument. An ingenious artificer, Mr Bramah, exerted all his powers on this piece of mechanism, and formed a lock, for which, in 1784, he obtained a patent, on this principle, that as in other locks the effect is produced by the extreme point of the key, in his it is performed by a lever, which cannot be applied to the bolt till a complete change has been produced in every part of the lock itself; and this is consequently done by a key on which there are six different surfaces applied successively to the levers in the operation of opening the lock; and unless the various heights of these surfaces, formed on the bit of the key, be accurately proportioned to the distance necessary to bring the notches which receive the ends of the levers projecting beyond the frame into a straight line with each other, they must remain in the same position without being at all affected. It is, therefore, impossible for any person to make a false key to open this lock; because, in the formation of it, it is necessary to fit the lock to the key, and not the key to the lock, so that the key must first be made, and the bit formed as fancy or chance may suggest, without any application to the lock; and one great advantage of it is the smallness of the key, and its being but a little way projected, which renders it easily portable to the owner.

An American gentleman, Mr Stansbury, also procured a patent for his improvement in locks. The key of his lock is of a peculiar construction, having a certain number of pins projecting from the bit or lower end, and which are of the same thickness with the plate; when the key therefore is introduced into the lock, and is turned round, it is pressed slightly forward against the plate, and when the pins and key are opposite the pin-holes, the pressure overcomes the resistance of the springs, the pins are forced out, and the key, catching hold of the plate, and being turned round, the bolt is forced back by the pin.

In 1778 another patent lock was invented by Mr Robert Baron; and his contrivance consists of what is termed a fly-tumbler. the object of which is to prevent any person from opening the lock even with its own key, unless he knows the particular movement of the key required to unlock it.

Another lock was contrived by Mr Thomas Ruxton of Dublin, for which he obtained a patent in 1816; and the object of his contrivance was to discover if any person had attempted to force the lock by a pick-lock or false key. Mr Chubb of Portsea, another ingenious artist, also invented a lock for the same purpose, and which he termed a *detector*-lock, greatly superior in its action to Mr Ruxton's, and admirably formed for the double purpose of detection and security. This lock not only discovers to the owner if any attempt has been made upon it, but also throws an obstruction or catch into the bolt so as not to allow its position to be changed, and which requires a regulator key before the lock can be restored to its former position.

There is still another, called the combination-padlock, which requires not a key, but a combination of letters to open it, and these letters form a syllable which ought to be known only to the owner, and which it is impossible to open without discovering the word for which it has been adjusted. This lock consists of a certain number of metal rings, separately moveable, and placed upon a tube of the same diameter. On the outside of these rings there are letters, so as to correspond with a notch in the inside of the ring, which, to enable the lock to be opened, must be placed in a line with certain marks upon the tube; for if any of these rings be not placed with the proper letter opposite the marks, the bolt cannot be withdrawn; but if the owner should forget the opening word, the lock will require to be forced before it can be opened.

LOCK also sometimes denotes a ringlet of hair; and also that piece of workmanship attached to fire-arms for igniting the powder.

LOCK, in canals. See NAVIGATION, INLAND.

LOCKE, JOHN, one of the most eminent philosophers of his own or any other age, born 1632, at Wrington, near Bristol, was educated at Westminster till 1651, and afterwards at Oxford. Feeling dissatisfied with the Aristotelian philosophy taught there, he turned his attention to other systems, and particularly to that of Des Cartes. He afterwards applied himself to the study of medicine, which he never practised, and took his degree of master of arts in 1658. He accompanied Sir William Swan as his secretary to the court of Brandenburg, and, having returned to England, he was introduced to the Earl of Shaftesbury, afterwards Lord High-Chancellor of England, who, during his administration, nominated him to several valuable appointments; and he also accompanied that nobleman, on his retirement, to Holland. During the time he remained in Holland, he had frequent meetings with M. Limborch, Le Clerk, and other eminent men. He returned to England at the Revolution, and obtained an appointment of about L.200 per annum, through the interest of Lord Mordaunt, and, in 1690, published his excellent treatise on the Human Understanding, a work which gained him the highest reputation. Being much afflicted with asthma, he retired to Cotes in Essex, devoting much of his leisure hours to the study of the Scriptures, and died at the age of 73, in 1704. He was author of Discourses on Government, Letters on Toleration, and Commentaries on some of the Epistles of St Paul, all which are esteemed works of considerable merit.

LOCLE, a town of Switzerland, situated in an extensive valley among the mountains of Neuchatel, and connected, by a range of cottages, with the village Chaux de Pond. The inhabitants amount to about 7000, and are distinguished for mechanical ingenuity. About 40,000 watches are made here annually, and they also carry on the manufacture of lace. In this place are several subterraneous mills, which are visited by strangers as objects of curiosity.

LOCO-MOTION, the act or power of changing place. See MOTION.

LOCUS, or LOCI, an important theory for the solution of many geometrical problems. See MATHEMATICS.

LOCUST, GRYLLUS. See ENTOMOLOGY.

LODE, a term among the Cornish miners, signifying a metallic vein.

LODGMENT, a work raised to cover the besiegers from the enemy's fire, and to maintain the post they hold.

LODI, a town of Italy, regular and well built, and containing a cathedral and numerous convents; is a bishop's see, and carries on a considerable trade. The inhabitants exceed 12,000, and are occupied in the silk and porcelain manufactures. Parmesan cheese, of the best quality, is made in the vicinity. The French gained possession of this place in 1800.

LOG, an instrument for measuring the velocity of a ship at sea; connected with which are the log line, reel, and half-minute glass. See NAVIGATION.

LOG, an ancient Jewish measure, of which mention is made in 2 Kings vi. 25. as the fourth-part of a cab, which is equal to five-sixths of a pint. A log of oil was offered at the temple by those cured of leprosy.

LOGARITHMS, from the Greek, signifying *ratio* and *number*, implies either the ratio of numbers or number of ratios. Logarithms are designed to obviate the necessity of long calculations by common numbers. They are a series of numbers in an arithmetical progression adapted to a series in geometrical progression. See MATHEMATICS.

LOGIC. See LANGUAGE.

LOGISTICS, the arithmetic of sexagesimals, and usually employed in astronomical computations. The term has also been applied to algebra.

LOGOGRAPHY, a method of printing introduced about the close of the last century, but superseded by the stereotype invention. See PRINTING.

LOGWOOD. See BOTANY and DYEING.

LOHEIA, a town of Yemen in Arabia, which carries on a great trade in coffee and mineral salt. The houses are constructed of mud. Provisions here of every kind are extremely plentiful. The bay before the town is so shallow that vessels have to anchor at a distance.

LOINS, LUMBI. See ANATOMY.

LOIR and CHER, a department of France, including the old provinces of Blaisois and Vermandois, and so denominated from the rivers of the same name by which it is traversed; is 34 leagues long and 23 broad, and is bounded on the north by the departments of Eure and Loire, on the west by those of the Sarthe, the Indre, and the Loire, on the south by that of the Indre, and on the east by that of the Cher. It is divided into three districts, and the chief towns are Blois, the capital, Vendome, and Romorantin. The principal rivers of the department are the Loir, Loire, Saudre, and Beuvron. In the districts of Blois and Vendome the soil is good, and affords pasturage, grain, and wines. Population, 211,152.

LOIRE, a department of France, composed of the old provinces of Beaujolois and Forez, and so called from the river of the same name; is 24 leagues long and 12 broad, and abounds in grain, wine, hemp, and pastures, besides coal, iron, and extensive forests. The Loire, Gers, Vecise, and Furens, are the principal rivers. Montbrison is the capital. The population amounts to 292,308.

LOIRE, the principal river of France, takes its origin in the mountains of the Cevennes in Languedoc. In its course to the Bay of Biscay, which is an extent of 500 miles, it becomes navigable at Roanne, and passes Nevers, Orleans, Blois, Tours, Saumir, and Nantes.

LOIRE, UPPER, a department of France, including the old province of Velay, is 26 leagues long and 17 broad, and watered by the Loire, the Borne, and the Allier. The produce consists of grain, wines, pasturage, horses, cattle, &c. Puy is the capital. The population is stated at 237,900. The river Loire rises at the northern extremity of this department.

LOIRE, LOWER, a department of France, so called from its being crossed by the river Loire, is composed of the bishopric of Nantes, and is 30 leagues in length and 27 in breadth. Grain, hemp, cattle, fish, salt, marble, and timber, are the chief productions. Nantes is the capital. Population, 368,500.

LOIRET, a department of France, including the old province of Orleanois, so denominated from a river of the same name which waters it; contains an area of 357 square acres, and produces wines, grain, brandy, saffron, &c. The capital of the department is Orleans. Population, 289,728.

LOLIUM, DARNEL GRASS, a genus of plants belonging to the Triandria class.

LOLLARDS, a religious sect, so called, according to some, from Walter Lollard; but, according to others, the term was applied as a mark of reproach. The Lollards first appeared in Germany in the 14th century. They maintained that Christ's sufferings were all-sufficient; that baptism was of no effect; and that repentance was not essential to salvation. Severe aspersions were brought upon their name by the vicious conduct of many of the members, who, at the same time, affected much piety: But numerous societies in Germany and Flanders were exemplary for their piety and virtue; insomuch that they were highly respected, and enjoyed considerable political privileges, which were even confirmed to them by Pope Julius II. The followers of Wickliffe were denominated Lollards, by way of derision, though, it is said, the English Lollards sprung from Germany. The celebrated Lord Cobham lost his life for his attachment to them.

LOMBARDY, a part of Italy, formerly so called from the Longobards, or Lombards, a nation of Germany, under Albinus, who founded the kingdom in the middle of the sixth century, and comprehending almost all the ancient Cisalpine Gaul. Lombardy was divided into upper and lower; and the former consisted of Piedmont, with its dependencies, and the duchies of Montserret and Milan, while the later included Parma, Modena, Milan, Ferrara, and several other principalities.

The Lombards were originally from Scandinavia, and their name is thought to have arisen from the peculiar dimensions of their beards, *long* denoting long, and *buert* beard. According to Prosper Aquitanus, bishop of Rhegium, who first mentions this people, they emigrated, in 379, from the most distant coasts of the ocean in search of new settlements, and subdued the Vandals in Germany. Having, by a series of successful wars, become extremely powerful, they obtained footing in Pannonia in 526, and, having conquered the Gepidae, they subsequently took possession of Milan, when Albion, their sovereign, was created king of Italy, which dignity they conferred upon him according to the custom of their own nation, by raising him on a shield in the midst of the army, and presenting to him a lance, the emblem of royalty. The kingdom of the Lombards continued for upwards of 200 years from its commencement in A. D. 570. Its ruin originated in the ambition of King Luitprand, who, having ascended the throne in 711, resolved on the extirpation of the Romans from Italy, by which enterprize the government of the Lombards in Italy was totally destroyed. Alarmed by the bold procedure of the Lombards, who also seized upon Rowenna, and several other cities belonging to the dominion of Rome, the Pope applied for the aid and protection of the king of France, who brought a powerful army against them in 754, and the Lombards, after a long and gallant defence, and sustaining all the miseries of a siege for the period of two years, were at length reduced by Charlemagne, the son of Pepin, in the year 774.

The Lombards, on their first arrival in Italy, were a barbarous and cruel race, with scarcely any vestige of laws, arts, or literature; but having been converted to the Christian faith, their native ferocity gradually improved, so that their laws and manners at length were totally changed, and the government of the kingdom was afterwards administered with so much mildness and equity that the surrounding nations envied the happiness they enjoyed. Whilst the laws of the kingdom were thus regulated, every individual was enabled to enjoy the fruits of his own industry, and to continue in the possession of his own property, without the apprehension of injury or oppression of any kind; so that the practice of dishonesty, of theft, murder, robbery, once so prevalent among the subjects of that kingdom, became at length to be almost entirely unknown. So mild, just, and equitable were all their laws, that, after their own government was dissolved, they were preserved in Italy for many ages.

LOMOND, LOCH. See DUMBARTONSHIRE.

LOMOND, BEN, a mountain of Dumbartonshire in Scotland, situated on the east side of Loch-Lomond, and rising to the height of 3262 feet above the level of the sea. That part of the mountain which skirts the lake is finely covered with coppice-wood, and affords many beautiful and variegated landscapes.

LONDON, the metropolis of the British empire, and perhaps the most extensive, populous, and wealthy city in the world, is finely situated on some rising grounds on the banks of the Thames, a noble river, and peculiarly adapted for its extensive trade and commerce. This city appears to have been founded by the descendents of the Goths, who had emigrated from Scandinavia between the reign of Julius Cæsar and that of Nero; and Tacitus informs us, that, about the year 61, it was a place of great trade, and soon after became the capital of the island. London is supposed to have derived its name from the Gothic language, *Lun* signifying a grove, and *den* a town; and the Goths, we are informed, were accustomed to build their towns in the woods. Others are of opinion that the name is of Celtic origin, and that it denotes a town upon the waters. The Welsh, again, derive it from *Llyn*, a lake, and *din*, a town, which signifies, in their language, a city on the lake.

History.—London was first surrounded with a wall, of hewn stones and bricks, by Constantine the Great. It had seven gates, and, being about three miles in circumference, was defended by fifteen towers. The emperor erected it into a bishop's see, as appears from this circumstance, that the bishops of York and London, and one other English bishop, attended the council of Arles as early as 314. It became the metropolis of England in the reign of Egbert, about the year 819, and afterwards increased so considerably under the Danish sovereigns, and under Edward the Confessor, that, on the invasion of William the Conqueror, the magistrates of London bestowed upon him the title of king. At the commencement of his reign, the citizens obtained from him a valuable charter extending only to five lines, beautifully written, in the Saxon character, upon parchment, and which is still preserved among the city archives. The city still continued to increase in size and opulence, although it was depressed by the tyranny of William Rufus, as well as by various inundations, fires, and hurricanes; but, under the reign of Henry I., the inhabitants obtained several additional immunities, when trade revived, and the arts flourished. During the succeeding reigns, the citizens obtained many important charters from their kings; and, although they were sometimes oppressed by individual monarchs, their power, liberty, and opulence, gradually increased, till they began to rival the power even of the crown. It is curious, however, to observe the progress by which the inhabitants of London have arrived at their present comfort and opulence. At first they were supplied with fuel from the neighbouring woods; and when the brewers, dyers, and other trades, who required large fires, began to make use of sea coal, the nobility and gentry, apprehensive lest so great a consumption might soon exhaust it, obtained the king's proclamation to forbid its use. In 1314, the city had greatly increased, and provisions became so scarce that it was necessary to crave the aid of Parliament to moderate the prices, though at that time the best live grass-fed ox cost only 16s. a fat sheep 1s. 4d. and a hen 1½d.

During the year 1348, it appears that a dreadful pestilence raged in London, which greatly reduced the price of provisions; in regard to horses, the finest hunter could be purchased for 6s. 8d. Besides suffering much during the rebellion headed by Wat Tyler, in 1381, the city was also disturbed by another set of rebels in 1450, under Jack Cade, an Irishman; and during the reigns of Henry VII. and VIII.

a vast number of the inhabitants, especially about the year 1518, perished by a disease termed the *sweating sickness*, which made its third appearance in 1528, when those who were attacked by it were carried off in the space of five or six hours. About 1537 the monasteries in England had become extremely numerous ; and when the dissolution of these institutions took place, the number of magnificent churches, cloisters, and other public buildings that were unroofed and ruined, is almost incredible. It was not till the year 1564 that the use of coaches was introduced into London, by one William Boonen, a Dutchman, who was appointed coachman to the queen. Other ladies of distinction, in imitation of her majesty, made use of them also in the country, to the astonishment and wonder of all the beholders. The prosperity of the city of London was greatly interrupted on the accession of James I. by the plague, which swept away upwards of 30,000 persons, and continued its devastations in the city, with greater or less violence, for the space of several years ; for the inhabitants, on the accession of Charles I. to the throne, were interrupted in their preparations for that event by the same calamity, 1625, which carried off no less than 35,000 persons. A circumstance occurred in the year 1645, which may be considered in no small degree as having contributed to the future prosperity of London. The merchants no longer having confidence in the integrity of their clerks, who frequently left them and entered the army, began, at this period, to commit their cash to the custody of the goldsmiths ; and as these persons received a commission both to receive their money and pay for them, the banking business was thus commenced. A dreadful plague again began its ravages in the city in 1665, having been introduced with goods from the Levant. The infection spread so rapidly, that every individual whose circumstances would permit hastened from the scene of death, and retired to the country. The streets were deserted, and every place of amusement closed. The church-yards were no longer capable of receiving the dead, and whole streets of families were swept away together. The dead-carts moved slowly along by torch-light, and the horrifying cry of *bring out your dead*, struck dismay and terror into every heart ; and " such was the dreadful malignancy of this scourge," says De Foe, " that, for about a month together, I believe there did not die less than 1500 or 1700 a-day, one with another ;" and Lord Clarendon computes the number carried off to be under-rated at 106,000.

To this succeeded another tremendous calamity, occasioned by fire, in 1666, when the number of houses destroyed amounted to upwards of 13,000. This fire, however dreadful it might be in its immediate consequences, was productive of many future advantages to the city. London arose with fresh beauty out of its ashes, when, by widening the streets and passages, infection appears to have been completely subdued, and London is now considered as healthy as any of its environs ; so that from these alterations, and the abundant supply of water, it is no longer subject either to pestilence or extensive conflagration. The metropolis having increased in population and commerce, a new establishment arose, known by the name of the Penny-post, the contrivance of one Murray, an upholsterer, in the year 1683; and it is astonishing to think how great a revenue it has produced, and how great a convenience it has been to the empire at large. The favour and protection given to the Papists by King James II. contributed to the glorious revolution in 1688, when he abdicated the throne.

In 1703, the kingdom of Great Britain experienced a dreadful storm of wind on the 26th November, which raged with excessive fury from 10 o'clock, P. M. till 7 next morning. By the violence of the storm, the metropolis sustained damage; and on many of the churches the lead was rolled up like skins of parchment, many houses were unroofed, and upwards of 2000 stalks of chimneys blown down. The veins and spindles of the weather-cocks in many places were bent, and many of the houses near Moorfields were levelled with the ground. In the river all the ships between London-bridge and Lime-house, with the exception of four, were thrown ashore, and upwards of 400 wherries entirely lost ; but the destruction at sea, during this dismal night, far exceeded that on land, and upwards of 1800 sailors perished within sight of their own shore. In 1715, another dreadful fire commenced in Thames-street, which destroyed upwards of 120 houses, with an immense quantity of rich merchandise, together with 50 individuals who perished in the flames. In 1720 that delusive system of speculation, termed the *South Sea Scheme*, was productive of most ruinous consequences to many of the citizens. Such were the effects produced by the failure of this speculation, upon public and private credit, that all trade was completely at a stand, and numbers of the first merchants and bankers of the city were obliged to abscond, and not a few of them quitted the kingdom never to return, whilst others, unable to bear their misfortunes, terminated their poverty and wretchedness by suicide. In 1730, London was visited by a dreadful fog, so dense that many persons mistook their way, and fell into the canal and into Fleet-ditch, where they perished. Another remarkable occurrence also took place, in consequence of an attempt of Sir Robert Walpole's to extend the excise, in opposition to the popular feeling ; when the lord-mayor, aldermen, and common-council presented a petition by the sheriffs against the bill, and were accompanied to the house by the chief inhabitants of London, in 200 coaches. The winter of 1739 was distinguished by the intenseness of the frost, which commenced on Christmas day and lasted till the 17th of February ; and the following year was likewise memorable for a dreadful hurricane in November, during which a considerable part of Hyde-park wall was blown down, many roofs of houses were stript off, and several persons killed by the falling ruins. Another destructive fire also broke out in 1748, by which several houses were destroyed ; and in 1751 the metropolis was greatly alarmed by two shocks of an earthquake. Many being of opinion that the laws against Papists were far too rigorous, an act was consequently passed for relieving his Majesty's subjects, professing the Romish religion, from certain penalties and disabilities imposed on them in the reign of

William III.; but many of the lower class of Protestants became alarmed lest this should lead to the increase of Popery, and a petition therefore was prepared against this act, when Lord George Gordon, with upwards of 50,000 citizens, marched through the city towards Westminster, each division of the rioters being accompanied by a banner, with the words "No Popery!" upon it. The rabble took possession of all the passages leading to the House of Commons as well as to the House of Lords, which they attempted to force open, but did not succeed. After this they divided into parties, and commenced the work of destruction, by demolishing the Catholic chapels, when all the furniture, rich ornaments, and altars belonging to them were consigned to the flames. Newgate was next broken open, the prisoners were set at liberty, and many private dwellings throughout the city were burned to the ground. Even the bank was twice attacked, when the rioters were repulsed by the military. Every thing that could impress the mind with terror was on this occasion exhibited, and no less than 36 fires were seen blazing at one time in the metropolis. No business could be transacted for some time; many lives were lost, and a number of individuals wounded. Some years after this period, in 1794, another fire broke out, which consumed 630 houses in Ratcliffe-highway; Covent-Garden theatre was burnt down in 1808; part of St James's palace, and likewise Drury-lane, were destroyed by fire in 1809. The next year was distinguished by a most joyful and happy event, when every part of the kingdom, but more especially the city of London, made splendid preparations for celebrating a jubilee, upon the 25th October 1810, on occasion of the entrance of George III. upon the 50th year of his reign. Five years after this period, in 1814, a numerous congress of foreign princes took place in the city of London, at which were present the emperor of Russia, the king of Prussia, aud several others, when they were magnificently entertained *by the Prince Regent, the Corporation of London, and other public bodies,* during the course of a fortnight, in the month of June.

Extent, &c.—During the last 60 years London has increased to an astonishing size, and, including Westminster, Southwark, and part of Middlesex, may be justly considered as a city of extraordinary extent, enormous wealth, and unrivalled commerce. From Limehouse in Deptford to Millbank and Vauxhall, it extends upwards of seven miles; and although its greatest breath does not exceed three, its circumference is fully 35 miles. London, with all the parishes included, comprehends about 1900 statute acres, or 30 square statute miles, and is divided into the city within the walls, the city without the walls, the city and liberties of Westminster, the out-parishes of Surry and Middlesex, and the parishes of Chelsea, Mary-le-bone, Kensington, Paddington, and St Pancras, with part of Highgate. The principal streets in London run in the direction of the river Thames from west to east, and these again are crossed by streets running from north to south. Of the two great leading streets, that called the Northern line commences at the north-side of Hyde-park, and runs along Oxford-street, Holborn, Newgate-street, Cornhill, to Whitechapel and Mile-end; and the other, called the Southern line, beginning at Hydepark-corner, continues through Piccadilly, Pall-mall, the Strand, St Paul's Church-yard, Watling-street, to the Tower of London, and from thence along the river side to Wapping; and the two principal cross streets are Tottingham-court-road and Goswell-street. London is supposed to contain about 9000 streets, lanes, courts, and alleys, above 60 squares, and about 170,000 houses, warehouses, shops, and other buildings. Most of the dwelling-houses are of brick, although a considerable number of the public buildings are of Portland and other stone, and several of the finest edifices are rented at upwards of L.1000 a-year.

Squares, Public Buildings, &c.—The finest squares in London are beautifully ornamented with walks, shrubberies, and ever-greens, and adorned with equestrian statues. The chief of these are Grosvenor, Berkeley, Russel, Manchester, Portman, Bedford, and Cavendish squares, in all of which are to be found the largest and most elegant houses. Besides these, there are many fine buildings deserving attention, especially in Waterloo-place and the street which runs from Carlton-house to the Regent-park. The palaces, or the town residence of the king, are Carlton-house, James's palace, Kensington palace, and Buckingham-house, in all of which the furniture and some of the public rooms are uncommonly rich and splendid. The other public edifices worthy of notice are, the Admiralty, Treasury, and Horse-Guards, Somerset-house, the Tower, the House of Lords and Commons, Greenwich and Chelsea hospitals, &c. Of the numerous public buildings which adorn the city, St Paul's and Westminster abbey may be considered as the most conspicuous. The former is situated on an eminence near the centre of London, and was originally founded in 610, and, after having been repeatedly destroyed by fire, was rebuilt by Sir Christopher Wren at the national expense. It cost nearly one million and a half, and was 35 years in building. For grandeur and beauty it perhaps exceeds any other edifice of the kind in the world, with the exception of St Peter's at Rome. Westminster abbey is another specimen of Gothic architecture, and the roof is entirely of wrought stone, and most delicately finished. Nothing can exceed the choir of the abbey, and the external decorations of Henry the Seventh's chapel, which, having fallen into a state of decay, was again renewed after the beautiful model o the original. Besides these, there are many other churches and places of public worship worthy of notice. The edifices devoted to the service of religion are very numerous. They consist of 102 parish churches, 69 chapels of the established religion, besides a great number of chapels belonging to foreigners, exceeding in all 400, without taking into account the 21 out-parishes usually included in the bills of mortality. In and near this city there are 100 almshouses, 20 infirmaries and public hospitals, three colleges, a number of theatres, and ten public prisons, besides numerous markets for provisions and commodities of all kinds. Above 4000 seminaries for education are established in London, and of these 237 are parish charity schools. Even the Sunday scholars alone are estimated at more than 40,000. This metropolis is no less remarkable for beautiful, commodious, and substantial bridges, built of the most durable blocks of stone brought from a great distance and at vast expense. Some of these may be considered as the most majestic structures of the kind in the whole world, being upwards of 42 feet within the parapets, and the arches 127 feet span. One of them cost, for the buildings and improvements, one million sterling, and yields nearly L.300,000 per annum. The most remarkable are those of Waterloo, Vauxhall, and Southwark. The centre arch of Southwark bridge is 240 feet span.

Institutions.—The institutions in London for the improvement of arts and sciences are very numerous. The most celebrated of these are the Royal society, which meets every Thursday evening in Somerset-house, the society of Antiquaries, (see INSTITUTIONS,) the society for promoting Arts, Manufactures, and Commerce, the Royal institution, British museum, and the Royal academy. Each of these institutions has a library belonging to it, containing numerous manuscripts, as well as rare and valuable books. Besides these and other public libraries, there are private ones that are very valuable and magnificent, such as those of Earl Spencer and the late Sir Joseph Banks; and indeed there are few streets in London without circulating libraries. Even the number of newspapers published here is almost incredible. Sixteen thousand morning papers daily issue from the press, and of the evening papers nearly 12,000 more, besides others, amounting in all to the number of 250,000 copies per week. The hospitals, and other public charities in London, are well regulated and richly endowed. Among these are Christ's hospital, St Bartholomew's, St Thomas', Bridewell, Bethlehem, St Luke's, and the Friendly hospitals, besides various others of considerable magnitude; and among the general charities of the city are the Magdalen hospital and asylum, the Marine society, the school for the indigent Blind, the society for bettering the condition of the Poor, the Philanthropic, Humane, and various others. The legal institutions and societies include those of the Temple, Lincoln's, and Gray's inn, and the other inns of court.

The exhibitions of natural curiosities are those at Exeter Change, the museum of living animals, and Bullock's museum in Piccadilly. In enumerating the public spectacles and places of amusement in the metropolis, the following may be noticed as the chief.

The first of those most worthy of attention is, the Royal academy at Somerset-house, consisting of an annual exhibition of pictures, by the most eminent artists of the nation. Most of these being the finest productions of modern times, cannot fail to present to men of genius and taste a most interesting object. In this academy, during the course of the winter, are delivered lectures on anatomy, painting, sculpture, and architecture. The works in these arts here exhibited, during the annual exhibition in summer, generally exceed one thousand.

In the gallery of the British institution there is likewise exhibited annually a collection of the works of living artists for sale, many of which are executed by the most celebrated masters. This collection is enriched by a valuable donation of 221 pictures of those inimitable artists, Hogarth, Gainsbro', Wilson, and others of distinguished merit, together with some of the exquisite cartoons of Raphael.

To these may be added the society of Painters in water colours, Spring-gardens, the Linwood gallery in Leicester square, being exquisite copies of paintings, in needle-work, of the finest pictures in England; also West's pictures, the European museum, and many panoramas; besides numerous and valuable private collections of pictures and statues, belonging to the nobility and various individuals of taste and opulence.

Besides these places of public amusement, others may likewise be noticed; and of these the theatres and opera houses, the Philharmonic society, the Appollonicon and Cecilian societies, the concert of ancient music, and the Italian opera in Hay-market, may be considered as the chief.

Government and Police.—The city is divided into 26 wards, governed each by an alderman, and out of that number the lord-mayor is annually elected. Of common council-men there are 236, who are annually chosen by the freemen-householders, besides a recorder, a common serjeant, two sheriffs, a chamberlain, a city-remembrancer, town-clerk, water-bailiff, and many other officers of inferior rank. Westminster is governed by a high steward, elected by the dean and chapter; and as this person is generally a nobleman, he appoints an under-steward, who discharges the duties of that office. London returns four members to Parliament, and the election is vested in the livery, consisting of about 10,000 voters. Southwark returns two members, elected also by the inhabitants, amounting to 11,000, and Westminster returns the same number, where the voters amount to nearly 14,000.

Trade and Commerce.—Considering London, with all its advantages, it is now what Rome was in ancient times, the seat of learning, of wealth, and of liberty, the nurse of arts and sciences, and the pride and admiration of the whole world. It may be viewed as the centre of trade and commerce, as it exchanges its commodities with all the countries of the kingdom, and with all the kingdoms of the earth. It is the grand emporium of the nation, to which commodities of every kind are sent from every quarter, and from whence they are again returned into every town in great Britain, and exported to every region of the globe. It employs innumerable carriages of every description, both by land and water, whereby a circulation of wealth is maintained through the national body, which is equally beneficial to all the members, and which has contributed so essentially to its prosperity and aggrandizement.

Population, Trade, &c.—To form any idea of the extent of this city, it is necessary to consider the number of the people resident in London, Westminster, and Southwark, which amounted to upwards of 1000,000 according to the census in 1811; and as London has since that time been continually increasing in extent and opulence, so it may be presumed it has also greatly increased in population. For their comfort and accommodation, the inhabitants daily employ upwards of 1200 hackney coaches, and perhaps a still greater number of private carriages; and the population is calculated annually to consume near 1000,000 sheep and cattle, besides other smaller animals, and 12,000,000 gallons of various kinds of distilled liquors. The value of coals, alone, is estimated annually to amount to nearly 2000,000. Such is the extent of the trade and commerce of London, that the property imported and exported annually is estimated at nearly 70,000,000. The two greatest branches of foreign trade are those of the East and West Indies; but although these employ a very great number of vessels, yet the trade of this port is otherwise very extensive; and in the course of the year about 14,000 vessels generally arrive at London.

LONDONDERRY, a county of Ireland, in the province of Ulster, bounded on the north by the ocean, on the east by Antrim, on the south by Tyrone, and on the west by Donegal; is about 36 miles in length, and 30 in breadth, and contains an area of 511,688 acres. The aspect of this county is irregular; a considerable part being bleak and mountainous, while the vales upon Roe and Mayola, and the borders of Lough Foyle, are very fertile. The climate is moist, yet, in general, healthy. The mountains are numerous, the highest of which, the Sawel, rises to the height of 1700 feet; and Ben-Nevenagh, the most magnificent, rises to 1500. Freestone, sandstone, lime, rock-crystals, and a variety of other minerals are found here. Iron-ore is thought to exist in abundance; but copper, lead, and chalcedony, are more sparingly obtained. The principal rivers are the Foyle, the Bann, the Roe, the Faughan, and the Mayola. The Foyle and the Bann afford tolerable harbours. These rivers contain a variety of fish; and salmon-fisheries are established at Coleraine and Culmore. The agricultural produce consists chiefly of oats, barley, flax, and potatoes. Cattle, sheep, goats, and pigs, are also reared in abundance.

The population of Londonderry, in 1813, exceeded 186,000, of which 80,000 were Episcopalians and Presbyterians. By the munificence of the present bishop of Derry, an excellent school-house is now erected within half a mile of the city; in which also there are several other very respectable seminaries.

The principal manufacture of the country is linen, the sales of which, in some years, amount to L.600,000. The bleaching-greens are numerous, and the process of bleaching, of late years, is much improved. Cotton and woollen stuffs are also manufactured in this district.

The chief towns, besides Derry, are Coleraine, Newtonlimavady, Magherafelt, Dungiven, and some others. The county sends four members to Parliament.

Londonderry, the capital of the county, is seated on the river Foyle, over which there is a handsome bridge. It is well built, and contains four principal streets, crossing at right angles, with a public terrace in the centre. The public buildings are the cathedral and several chapels, the town and linen-halls, the jail, the infirmary, and the theatre. The population is about 18,500. Commerce is considerable; and the fairs and markets are well supplied. The corporation consists of twelve aldermen, twenty-four burgesses, a chamberlain, and two sheriffs. A newspaper is also regularly published here under the name of "The Londonderry Journal." This city is 59 miles from Belfast, and 115 from Dublin.

LONG-ISLAND, an island of the United States of America, in the state of New York, extending about 140 miles in length, and from 10 to 14 miles in breadth; and divided into King's, Queen's, and Suffolk counties. The south side of the island is flat, and the soil, although light and sandy, is well adapted for producing Indian corn; but the soil on the north side is stronger and more favourable for the cultivation of grain and fruit. Large herds of cattle are reared and fed in Queen's county on Hamstead plain. Plover frequent this part of the island in vast numbers.

LONGEVITY. The extraordinary duration to which human existence was prolonged in those ages of the world previous to the flood, has already been noticed under the article ANTEDILUVIANS. As mankind multiplied, the term of human life gradually decreased from the astonishing age of 900 years down to three score and ten, the average period beyond which the life of man now rarely extends. Having reached this medium about the third century after the flood, it has so continued to the present day, as appears from history both sacred and profane. Pliny has furnished us with many examples of longevity which correspond with the experience of modern times; and although instances of this kind are limited to no particular time or country, yet it has been found by experience, that, in colder climates, such as those of the northern parts of Europe, many individuals have lived far beyond the period of 100 years, whilst in warmer regions, such as China, comparatively few arrive at 60. In that vast empire, in 1784, we are informed that only four persons were found whose individual ages exceeded the term of 100 years.

The mild and temperate climate of Italy seems, at an early period, to have been peculiarly favourable to longevity; for, in the year 79, according to Lord Bacon, there lived, between the Apennines and the river Po, 124 persons not one of whom was less than 100 years of age, while some were considerably older. Britain, also, it appears, has been remarkable for instances of longevity. Mr Carew states, in his Survey, that the age of 90 is by no means uncommon in Cornwall; and as examples of longevity, he mentions Brown the Cornish beggar, who lived to 120, and one Polezew, who reached the age of 130. The Statistical Account of Scotland likewise furnishes numerous examples of the same nature. About 20 years ago, in the lower parts of Galloway, twelve persons are stated to have lived from 100 to 115 years; and one individual, of the name of Marshal, a tinker, was even capable of travelling through the country at the very advanced age of 118. In the neighbourhood of Montrose, and in the Hebrides also, many instances of longevity have occurred of late years; and Martin, in his Description of the Western Isles, particularly mentions a person in South Uist, who retained his faculties to the age

Longford.

of 130, and one Gilmour M'Crain, in the island of Jura, who had reached the vast age of 180. In England, also, the names of several individuals are upon record who have reached a surprising age, as may be seen in the *Phil. Trans.* No. 221. In the county of York, in 1670, Henry Jenkins died at the age of 169, and, in Shropshire, Thomas Parr at 152.

Such uncommon instances of longevity, however, are but rarely to be found in populous cities. In London the deaths, from 1728 to 1758, amounted to 750,322, and in all that vast number only 242 individuals had reached the period of 100 years.

The desire of self-preservation being an instinctive principle of our nature, the means most conducive to health and long life are worthy of the most serious consideration. In the attainment of this object, a temperate and well regulated system of living is assuredly of the very first importance; and the circumstances essential to the prolongation of human life are, healthy parentage, clear air, wholesome diet, exercise, sleep, and the proper regulation of the appetites and passions. It is universally acknowledged that healthy parents will have healthy children, whereas hereditary disease of any kind must be preventive of a prolonged existence. By reports communicated to Sir John Sinclair from Greenwich and Kilmainham hospitals, and from workhouses in and about London, it appears that, of 598 individuals above 80 years of age, 303 were sprung from long-lived ancestors. The essential importance of fresh air to the enjoyment of health is sufficiently known and acknowledged, and the modern invention of ventilators has been found of the greatest use, both in the recovery of health, and in preventing disease. By the introduction of these into the lying-in hospital at Dublin, it is supposed that not less than 660 lives were annually saved. The learned Dr Darwin earnestly advises parents, for their own sake as well as for that of their children, to change the air by opening their windows several times a-day. Respecting diet, Galen says: "Consult your reason, and observe what agrees and what does not agree with you, that, like wise men, you may adhere to the use of such things as are conducive to your health, and reject every thing which, by your own experience, you find to do you hurt." Moderation and regularity, therefore, in diet, are equally indispensable to the enjoyment of health and the prolongation of life, as well as regular exercise and sleep; and, above all, the proper regulation of the passions requires to be strenuously and habitually maintained; since experience teaches us that hope and joy influence the nervous system, and are highly conducive to the restoration of health, whereas terror, despair, and grief undermine the constitution, depress the affections, and finally, engender the most destructive diseases. The influence of religion and virtue upon the mind, therefore, is not only highly favourable to tranquillity and enjoyment, but also to the desirable prolongation of human life.

LONGFORD, an inland county in the province of Leinster in Ireland, bounded on the west by the county of Roscommon, on the north by Cavan and Leitrim, and on the east and south by Westmeath; extends about 35 miles in length and 24 in breath, and contains 23 parishes. The aspect to the northward is rugged and mountainous; and in the south-west part of the county there is a bog consisting of 36,000 acres. Longford, however, produces considerable crops of oats. The county is watered by the Inny and the Shannon, and lough Gawnagh occupies several acres. The population is rated at 50,000. Besides the manufacture of linen, the inhabitants are employed in spinning and bleaching. Considerable quantities of yarn and hemp are likewise sent to distant markets. The principal towns are Longford, Granard, Lanesborough, and Edgeworth-town. The county sends two members to Parliament.

Longimetry | Loo-Choo.

Longford, the capital, is a regular built town, situated on the river Camlin, and has a charter-school for 60 boys. It is a post and market town.

LONGIMETRY, the art of measuring heights and distances. See *Mensuration* under MATHEMATICS.

LONGINUS, DIONYSIUS CASSIUS, a philosopher, who lived in the third century. He was the preceptor of Porphyry, by whom he is highly praised in his life of Plotinus. His acquired knowledge was extensive to a degree hardly credible, insomuch that Eunapius calls him a living library. He was author of various works, and among others the admirable Treatise on the Sublime has been ascribed to him. Amati, however, has completely proved that there is no sufficient authority for attributing this treatise to the pen of Longinus, and that strong arguments exist for referring it to an earlier period. His own belief, however, that Dionysius of Halicarnassus is the author, is not entitled to much respect. Longinus was the preceptor of Zenobia queen of Palmyra, and, as Vopiscus informs us, was put to death in the year 273 by the emperor Aurelian, under suspicion of being the author of a letter which this princess had written to him, and which gave him great offence. Zosimus praises him for his learning, his writings, and his fortitude in submitting to his fate.

LONGITUDE. See ASTRONOMY and NAVIGATION.

LONGOMONTANUS, CHRISTIAN SEVERINUS, a Danish astronomer, was born in 1562, at Longomontium in Jutland. At the college of Wiborg he prosecuted his studies during the intervals of manual labour. He was associated for eight years with the celebrated Tycho Brahe, at Copenhagen; and in 1605 he became professor of mathematics in the university of that place. His principal work, *Astronomica Danica*, was published in 1622; and in 1639 appeared his *Introductio in Theatrum Astronomicum*. He died in 1647, in the 85th year of his age.

LONGTOWN, a market town of Cumberland in England. See CUMBERLAND.

LONISERA, HONEYSUCKLE. See BOTANY.

LONSDALE, a market town of Westmoreland, seated on the river Loyne, over which there is a bridge. It has an elegant church, and the population is about 1300.

LOO-CHOO ISLANDS, named also by the natives, Doo-Choo, and by the Chinese, Low-Kow, are situated about the parallel of north latitude 26°

in the sea of Japan, and are 36 in number. They were but little known to Europeans till visited in 1816 by captain Bazil Hall, of his majesty's ship Lyra. The largest of the islands, called the Great Loo Choo, is about 10 or 12 miles in breadth, and 56 in length. Towards the north this island is elevated and covered with wood, but barren towards the east, and towards the west and south it is highly cultivated and fertile. The climate here appears to be very temperate, although vegetation is not so rapid and luxuriant as in those places which are nearer to the equator.

Cattle and horses, which are numerous, are in general of a diminutive size, and the island abounds with hogs, goats, and poultry. The fields are productive of wheat, rice, and Indian corn; also of sweet potatoes, tobacco, and sugar-cane. The natives make use of canoes with two sails, mostly formed of one piece of wood, and to increase their velocity they also make use of paddles. They have excellent roads; manufacture their own cloth, and embroider their girdles. In architecture, also, they have made considerable progress, as appears not only from their cottages but from their temples. They have but few books; and, in respect to literature, their knowledge appears to be extremely limited. Their young men of rank are usually educated in China. They worship the god Fo, yet in all religious matters they appear to be remarkably indifferent, and they as often worship the evil being as the good. For their food, they chiefly make use of eggs, flesh, fish, and vegetables; and, during meals, frequently drink a light wine called *sackee.* Their form of salutation consists in stooping forward and raising their hands, closed in each other, to the face. Ignorant of the value of money or coin, they produce no articles of commerce; and although they carry knives in their girdles, they appear to be totally ignorant of the art of war, and seem to live in the greatest contentment. It is doubtful whether polygamy prevails among them, excepting in so far as it is permitted to the sovereign. The females are chiefly employed in the labours of the field, and are consequently held in a state of degradation. Those among them of the higher class live in a state of seclusion, and are seldom or never seen in the presence of strangers.

In their dispositions, the people of Loo Choo are gentle and unassuming, extremely timid, polite, and respectful. Free from all discord and avarice, they are, in their temper, extremely pleasing; and in no instance whatever did it appear that their European visitors, during their stay, were deprived of a single article, even of the smallest value. Captain Hall, indeed, represents them as possessed of the most harmless and friendly disposition, not only towards those of their own tribes, but also towards strangers.

LOOKING-GLASS, a plane mirror, which reflects the images of things placed before it. See *Mirror* under OPTICS.

LOOK-OUT, in sea-language, is a strict watch kept on the forecastle of a ship, for any expected event, or to prevent danger.

LOOM, a frame used in the different branches of weaving. See CLOTH-MANUFACTURE.

LOOM, at sea, applies to a ship appearing with a great sail at a distance; when they say, *she looms.* A loom-gale is one in which a vessel can carry her top-sails a-trip.

LOPHIUS, the TOAD-FISH, or SEA-DEVIL. See ICHTHYOLOGY.

LORCA, anciently CLIOCRATA, a town of Spain in the province of Murcia, situated on the Guadalentin, consists of the upper and lower towns. Lower-town is the more modern, the streets and squares of which are spacious and regular; and the Hotel-de-ville, and various churches, are handsome structures. This town has also two very extensive suburbs. The population of Lorca is about 30,000. Saltpetre is manufactured, and silk and kali exported. This place suffered dreadfully in 1802 from the sudden bursting of a great basin of water, which swept every thing before it to a great extent. Besides the loss of 6000 lives, the destruction of property was estimated at L.2,083,333 Sterling.

LORD, a title of honour nearly synonymous with a peer of the realm. See HERALDRY.

LORETTO, a small fortified town of Italy, situate in the marquisate of Ancona, near the gulf of Venice, about 112 miles from Rome, is the see of a bishop, and its population amounts to nearly 7000. The cathedral contains the *Casa Santa,* or Holy-chapel, in which it is said the Virgin Mary lived at Nazareth, where the infant Saviour was born, and in which the angel had hailed her blessed of the Lord among women. It is pretended that this chapel, which is 31 feet long, 15 broad, and 18 high, was carried from Galilee into Dalmatia by the angels, and from thence to the place where it now stands. Without, it is cased with marble; but within, it is much decayed. In a niche of silver upon the principal altar stands the illustrious lady of Loretto, with the child Jesus in her arms, adorned with jewels, and surrounded by a great number of gold and silver lamps. A vast number of pilgrims visit Loretto, and, having performed their devotions, each of them offers a present to the Virgin; so that this chapel was immensely rich, till violated by the French in 1796, who left nothing remaining but the image of the Virgin. The inhabitants live chiefly by agriculture and gardening.

LORIMERS, one of the companies of London, mentioned in 1 Richard II. c. 12. and who make bits, spurs, and similar articles.

LORRAIN, a department in France, but formerly a sovereign state.

LORRAINE, CLAUDE, or CLAUDE GILLEE, an eminent painter. See DESIGN.

LOSS and GAIN, a rule in practical arithmetic, by which a merchant is enabled to ascertain his state in trade.

LOSTWITHIEL, a borough and market town of Cornwall. See CORNWALL.

LOT, the kinsman of Abraham, whose history is recorded in the book of Genesis.

LOT, one of the southern departments of France, watered by the river of the same name, is 34 leagues in length and 30 in breadth, containing an area of 376 leagues. The surface of this department is hilly, but the soil is excellent, and the country produces grain, wine, silk, wool, and iron. The principal rivers are the Lot, the Dordogne, the Aveiron, and the Tarn. The first of these rivers is navigable from

Cahors. The chief towns are Cahors, Montauban, Figeac, and Gourdan. The population is estimated at 383,683.

LOT and GARONNE, one of the south-west departments of France, is 23 leagues in length and 18 in breadth, and watered by navigable rivers of the same name. It is very fruitful, and the forests occupy nearly 49,000 acres. Grain, wines, brandy, and hemp, are the chief productions. The towns are Agen, Marmande, Nerac, and Villeneuve-d'Agen. The population is 352,908.

LOTHIAN, a district of Scotland, including three counties, Haddington, Edinburgh, and Linlithgow, which are denominated East, Mid, and West Lothian; and are already described in the order of the alphabet. Lothian was taken possession of by the Saxon invaders, A. D. 450, and became the scene of strife between the Saxon-Gaels or Scoto-Irish; and was at length ceded to Malcolm II. A. D. 1020. Lothian was viewed as distinct from Scotland in the reign of David I. and the present division of the county is dated from the beginning of the twelfth century.

LOTION, a wash applied for the beautifying and cleansing of the skin.

LOTTERY, a game of chance, in which deposits are hazarded for prizes of money or goods. Lotteries were first invented by the Romans, and are common in Britain, France, and Holland. They have been, and are more or less prevalent in all the kingdoms of Europe. The first English lottery was drawn in St Paul's in 1569, and consisted of 40,000 lots at ten shillings each. With the profits of this lottery the harbours and public works were repaired. The main design of government lotteries, indeed, as a matter of policy, is to augment the revenue of the country. This species of gambling having become very popular, private lotteries were introduced, in 1698, to such a degree, that their suppression by act of Parliament became indispensable. Government lotteries, however, were still continued, and the buying and selling of chances was carried on to so great an extent, that an act was passed against the practice in 1718. Lotteries were entirely suppressed in Queen Anne's time, but have since been licensed, under proper regulations. The act of 1778 requires each office-keeper to pay L.56 for licence yearly; and, under a penalty of L.50, no share less than a sixteenth must be sold. Likewise any person who shall publish a scheme for receiving monies in consideration of any ticket in the lottery, without being in the possession of such ticket, shall forfeit L.500. No office for the sale of tickets is allowed in Oxford or Cambridge, on penalty of L.20. This statute proved highly beneficial; for, previous to its enactment, the lotteries in London exceeded 400, whereas the whole number in Britain afterwards was but 51. By the act 42 Geo. III. c. 119. keeping an office for any game or lottery not authorised by law, subjects to a fine of L.500; also the act 49 Geo. III. c. 94. contains various new enactments.

LOTUS, Egyptian Water-Lily. See Botany.

LOVE, one of the affections of the Mind, treated of under that title.

LOVE-APPLE, the fruit of a species of solanum, which has a peculiar appearance, and is therefore cultivated in gardens.

LOUGHBOROUGH, a town of Leicestershire, with a population of 5400. It contains a spacious church and several schools.

LOUIS, the name of many of the kings of France. See France.

LOUIS D'OR, a current coin of France, first struck in the reign of Louis XIII.

LOUISBOURG, the capital of Cape Breton island in North America. It is situated on the south-east of the island, and is about half a mile long and two miles in circumference, with a good harbour. See Cape-Breton.

LOUISIANA, or Missouri Territory, a district of North America, in length about 1400 miles, and about 1108 in breadth. It is bounded on the east chiefly by the Mississippi, and on the south by the gulph of Mexico, on the north by the river Winnipec and the 49th parallel of latitude, and on the west by New Mexico. It was first discovered by Ferdinand de Soto in 1541, but, owing to the resistance of the inhabitants, it did not come into the full possession of the Spaniards till 1769. In 1800 it was ceded by Spain to France, and afterwards delivered over to the United States in 1803, and consists of two governments, the one the state, and the other the territory of Louisiana, the former containing five districts and the latter seven. The greater part of the population are of French and Canadian extraction, although the descendants of the people of Germany as well as Acadians are frequently to be met with. Situated between the extremes of heat and cold, the climate varies much, especially towards the north. The timber, however, is extremely fine, and the country produces astonishing quantities of oak, cedar, ash, cypress, and mulberry. Towards the Mississippi the fruits are very rich, and in great abundance as well as variety. The soil seems also admirably suited for flax, hemp, and tobacco, as well as indigo. This territory likewise abounds in mineral substances, in lead, copper, zinc, iron, marble, nitre, salt, and coal, and is intersected by a number of fine rivers, among which are the Missouri, Arkansa, Moingona, and Red river, which all empty themselves into the Mississippi. Few manufactories of any extent are established, although the Acadians make cotton quilts and cottonades, while the poor among the planters also spin a kind of cloth mixed with wool for the use of the slaves. They have manufactories for cordage, and also distil taffia, refine sugar, and carry on a considerable trade by sea, in indigo, cotton, rice, sugar, wax, and timber. There are now established two societies for the advancement of the arts and sciences, one at New Orleans and the other at Natchez. St Louis is the chief town of the territory, and New Orleans of the state, and the population of both amounts to nearly 100,000.

LOUSE. See Entomology.

LOUTH, a county of Ireland, in the province of Leinster, bounded on the north by Armagh, on the north-east by Carlingford bay, on the east by the Irish sea, on the south by Meath, and on the west by Meath and Monaghan, is about 27 miles in length and 18 in breadth, containing an area of 177,926 acres. This county has a very agreeable aspect, the soil being generally rich and under high cultivation. Considerable progress has been made in agriculture; and the produce consists chiefly of wheat, oats, flax, and potatoes. Whinstone is found in abundance, as also limestone and some ochres, the two latter, however, less frequently; and several slate quarries are wrought. The Boyne is the principal river. Dundalk, Carlingford, and Drogheda, already described, are the most considerable towns. Louth contains a population of about 57,750, and sends one member to Parliament.

LOUTH, a market town of Lincolnshire, in England, situated on the river Ludd. The church, town-hall, theatre, and other buildings, are elegant; and the vicarage-house is worthy of notice. The inhabitants exceed 4760, and are employed in the woollen, soap, and paper manufactories. The trade is considerable, and greatly facilitated by means of a canal.

LOUVAIN, a city of the Netherlands, the seat of a once celebrated university, stands upon the Dyle, about 14 miles from Brussels; and is about seven miles in circuit, but its walls are now much decayed. It has an old castle and several magnificent churches and convents, and is adorned with numerous vineyards and fine gardens, which now only tend to indicate its former opulence and grandeur. The French took possession of it in 1794.

LOW COUNTRIES. See NETHERLANDS.

LOWESTOFF, a market town of England in the county of Suffolk, situated on an eminence, with a view of the German ocean. It consists of one principal street. The public edifices are the parochial church, and several meeting houses, the corn-cross, grammar-school, theatre, forts, and light-house. Lowestoff depends on the herring and mackarel fisheries, which are considerable. It is a great place of resort for sea-bathing. The population is rated at 3189. There are also manufactures of pottery and cordage.

LOWTH, ROBERT, a distinguished commentator and divine, born near Winchester, in 1710, and died at Falham in 1787. For some time he held the professorship of poetry in the university of Oxford; and, besides his admirable lectures *De Sacra Poesi Hebræorum*, he published the life of the bishop of Winchester, and afterwards was raised to the bishopric of London. He also published an Introduction to English Grammar, and lastly, a translation of Isaiah. As a specimen of his poetical talents, he gave to the world, Verses on the Genealogy of Christ, and the Choice of Hercules. His amiable character endeared him to every one with whom he associated; and he was no less esteemed for his virtues than admired for his learning and splendid talents. See LANGUAGE.

LOXIA, a genus of birds of the order Passeres. See ORNITHOLOGY.

LOXODROMICS, the theory of sailing obliquely, or by the Loxodromic line. See NAVIGATION.

LOYOLA, IGNATIUS, the celebrated founder of the order of the Jesuits, was born in 1491, in that part of Biscay called Guipuscoa, and educated under Don Juan Velasco, grand treasurer to his catholic majesty, with whom he spent his early years. At the age of fifteen he became one of the pages at court; but preferring a military life, he entered the army, in which he continued till his thirtieth year; when, having had one of his legs shattered at the siege of Pampeluna, he became an itinerant saint. During his convalescence, a book entitled "*The Flower of the Saints*," and fraught with the most marvellous stories, operated so powerfully on his mind, that he resolved on making a barefooted pilgrimage to the Holy Land. He set out accordingly; and having arrived at Jaffa in 1523, he visited all the holy places, till he made himself obnoxious by his attempts to convert the Mahometans. Finding himself no longer safe, he departed, under the impression that God wished him to leave Palestine. In 1524 he commenced the study of Latin with a teacher at Barcelona, and two years afterwards he removed to the monastery of Alcala, for the purpose of studying theology and philosophy. He was now full of his projected scheme of spiritual knight-errantry, to which he had already gained a number of proselytes. Induced by ill treatment to leave Spain, he went to France, and prosecuted his studies at the college of de Montaign; where also he gained over numbers to his views, which, however singular, were nevertheless caught with all the wildness of enthusiasm. These disciples, as well as their master himself, went on preaching and converting, in order to bring about the spiritual conquest of the world; and Loyola set out for Venice in 1535, where, having increased the number of his followers, he applied to Paul III. and obtained for himself and his disciples the order of priesthood. The adherents of Loyola were now dispersed among the principal schools of Italy, for the interest of the cause; and they mutually bound themselves to lodge in the hospitals, beg their bread, be superiors by turns, and take no reward for their services.

Loyola with his associates was well received at Rome in 1537, when he made an attempt to establish them as a troop of spiritual knights, with the title of the order of Jesus. The plan was consequently submitted to the Pope, who warmly countenanced it; and the order was accordingly sanctioned by a bull issued on 27th September 1540. Loyola governed the order, and lived to see it extended over Europe and the Indies, China, and Abyssinia. He died in 1556, in the 65th year of his age, and was canonized by Pope Gregory XV.

LOZENGE, any oblique angled parallelogram, as the rhombus and rhomboid. Various medicaments are made up in this form, which is found convenient for use. See PHARMACY.

LOZERE, one of the nine southern departments of France, so called from a mountain of the same name, bounded on the north by the departments of the Upper Loire and the Cantal, on the west by Aveyron, on the south by the department of the Gard, and on the east by that of the Ardeche, and is divided into three districts. It is very mountainous, but produces grain, pasture, and fruits, and the pine trees in the vicinity of Langogne are excellent. The forests occupy about 44,000 acres. In the canton of Meude are mineral waters, and also mines of silver, tin, and copper. Meude, Marvejols, and Florac are the principal towns; and the population is estimated at 153,936.

LUBEC, a maritime city in the duchy of Holstein, in Lower Saxony, and formerly the see of a bishop, is situated on the river Trave, at the distance of 35 miles north-east from Hamburgh. Among the principal buildings are, the cathedral, four churches, the college, the town-house, which is a splended edifice, the council-house, and the exchange. The cathedral contains some fine paintings, and the church of St Marie is remarkable for a singular ancient clock. So very large are the doors of the houses in Lubec, that carriages are commonly received through them into the hall, which consequently serves the purpose of a coach-house. Lubec contains a population of 42,000; but, as a great commercial city, it has very much declined. The famous Hanseatic league was formed in it in 1164. There being no Jews allowed in the city, they have a village of their own in the neighbourhood.

LUCAN, Marcus Annæus, an illustrious poet, a native of Corduba in Spain, was born about the year 39. He was the son of Annæus Mela, brother of Seneca the philosopher, and of Galliæ proconsul of Achaia; his mother was Acilia the daughter of Lucanus, an eminent orator. His preceptors were Palemon, Virginius, and Cornutus the Stoic, the most celebrated grammarian of his age. He soon rivalled them in learning, and had scarcely attained the age of 14 when he could speak the Greek and Latin languages with the utmost fluency. His genius soon raised him to distinction at Rome, where his poems were ranked with those of Persius the satirist; and before he was of age he was appointed to the office of augur and questor by the emperor Nero, who upon many other occasions bestowed upon him flattering marks of his esteem. He married Polla Argentaria, equally distinguished for her learning, high birth, and great beauty. Having presumed to sustain a competition with Nero for the prize of poetry, it was unfortunately adjudged to him. The pride of the tyrant was mortified at the increasing reputation of his rival, and Lucan having imprudently involved himself in the conspiracy of Piso, was discovered, arraigned, and condemned to suffer for his crime. After the example of his uncle Seneca, his veins were opened, and he yielded to his fate with the calmness of a philosopher and the intrepidity of a hero. His Pharsalia has been translated into English verse by the poet Rowe. The best editions of his works are those of Burman 1740, in 4to, and of Bently, Strawberry-hill, 1760, 4to.—See *Taciti Annal.* and Hayley's Second Epistle on Epic Poetry, Notes.

LUCANUS, the Stag Beetle, a genus of insects of the order Coleoptera.

LUCCA, a fertile and populous duchy of Italy, bounded on the north by Modena, on the south-west by the Mediterranean, and on the other quarters by Etruria, is nearly 40 miles in length, and 20 in breadth. Cattle, wine, oil, silk, and wool, are produced in abundance, and the natives are remarkable for their industry.

Lucca, the capital, stands in a delightful situation, and abounds with villas, summer-houses, and plantations. The rampart, which admits a carriage, is adorned with trees. The town is well built, and the streets are spacious. Among the principal buildings are the palace and two cathedrals. The population is 25,000. Paper is manufactured to a vast extent; and the annual produce of oil in the territory amounts to 180,000 rix-dollars.

LUCERNE, the capital of a canton of the same name in Switzerland, situated at the foot of Mont Pilatus, surrounded with walls. The public edifices, are the hotel-de-ville, the arsenal, the cathedral, and an hospital and library. Three excellent bridges are worthy of notice, as objects of curiosity; as also the slide at Alpnach, by which the pine trees are brought down to the lake, and which is 44,200 feet or eight and a half English miles in length. This remarkable work cost L.9000. The lake is seven miles long and three broad, and abounds with most interesting scenery.

LUCIA, St. one of the Caribbee islands in the West Indies, about 32 miles in length and 12 in breadth, and divided by a range of hills into Basseterre and Cabes-terre. There is an excellent harbour on the west coast, which is capable of holding 30 ships of the line. The island consists of nine parishes. In 1777, the population amounted to 14,199. This island was first possessed by the English in 1635. It was restored to the French in 1815.

LUCIAN, a celebrated Grecian satiric writer, born of obscure parents at Samosata, on the Euphrates, in Trojan's reign. He was intended for a statuary, but, declining that art, he went to Antioch, and engaged in literary pursuits. He afterwards studied the law, and became register of Alexandria in Egypt. Among his numerous works, his Dialogues may be considered as a specimen of exquisite satire.

LUCID INTERVALS, the time which lunatics appear to be in their senses.

LUCIDA, CORONÆ, a fixed star of the second magnitude. See Astronomy.

LUCIDA LYRÆ, a star of the first magnitude in Lyra. See Astronomy.

LUCIFER, the name of the planet Venus when she appears before the rising sun. In mythology Lucifer was the son of Jupiter and Aurora, and Lucifera is a name by which Diana was invoked by the Greek females in child-bed; and she was represented as veiled, with a crescent on her head, and a lighted flambeau in her hand.

LUCKNOW, the capital of the province of Oude in Hindostan. See Hindostan.

LUCRETIA, a Roman lady of noble extraction, remarkable for her beauty, but still more so for her virtue and misfortunes, was the wife of Collatinus, a relative of Tarquin the last king of Rome. It is unnecessary to relate minutely the circumstances of her history, or the villany that reduced her to the alternative of dishonour or death, as these are already well known. The circumstances of this transaction have been related by Livy and other Roman historians, as well as by Ovid and several other of the poets.

LUCRETIUS, or Titus Lucretius Caius, an eminent Roman poet, born in the second year of the 171st Olympiad, and in the 658th of Rome, killed himself in a fit of madness in the 44th year of his age. During his lucid intervals, he wrote his six books, *De Rerum Natura*, a work of distinguished merit, in which he illustrates the physics of Epicurus, and which Cicero corrected after his death. It is understood that he was a disciple of Zeno, and in his poem he has discarded the belief of a Providence, accounting the opinions of the people nothing more than vulgar errors. His works have been translated into English verse by the poet Creech, and more recently by Dr Mason Good. For a more extended account of him, see the Dictionary of Hoxeri.

LUDLOW, a market town of Shropshire in England, situated at the junction of the Teme and Corve, over the former of which there is a fine bridge; is well built, and contains a church, market-house, town-hall, and the ruins of a celebrated castle. The population in 1811 was 4,150. Ludlow sends two members to Parliament.

LUES VENEREA. See Medicine.

LUFF, the order to guide the ship's head nearer to the direction of the wind. To keep a good luff, is to hold her way well without deviating to the leeward of her course.

LUGANO, a town of the canton of Tesino in Switzerland, situated on the lake of the same name. It is a place of considerable trade; and woollen and silk, snuff, paper, and gunpowder manufactures are carried on; likewise iron and copper are wrought in the vicinity. The lake is 10 leagues long and one broad, and affords abundance of fish.

LUGNETZ, or Longnaza, a wild and extensive valley in the canton of the Grisons, which is visited by travellers on account of the very romantic scenery. The rocks are mostly argillaceous schistus; and lead, copper, and sulphate of magnesia are found in abundance. Piz-Valrhein, the highest mountain, is 10,220 feet above the level of the sea.

LUKE, St. the Evangelist, as Eusebius and others inform us, was a native of Antioch, by profession a physician, and for the most part the associate and companion of the apostle Paul. From the testimony of some of the ancients, Basnage, Fabricius, and Dr Lardner have been led to suppose that he was a Jew, and many of the learned have been of opinion that he was one of the seventy. This evangelist is first mentioned in the New Testament in his own Acts of the Apostles, where we find him at Troas with his friend St Paul, whom he attended to Jerusalem, and with whom he continued during his troubles in Judea, and during the two years confinement of that apostle in the imperial city, after Paul was sent prisoner from Cæsarea to Rome. St Paul mentions him by name in one of these epistles written during his imprisonment, in which he is stiled the beloved physician. It is probable he died a natural death, as no mention has been made by any of the historians of his having suffered martyrdom. He was not an apostle, but, being the companion of St Paul, he committed to writing the gospel preached by him. He tells his reader with what anxious solicitude he had examined the historical facts on which Christianity was founded, and what care and study he had employed to arrange and digest these great events in a regular series, in order that his readers may see on what firm and unshaken basis that religious system is founded, into the doctrines of which Theophilus and his other converts to Christianity had been so carefully initiated. This cannot fail to mark his fidelity as an historian, and to prepossess the reader in favour of the veracity and probity of the writer. His Gospel, and the Acts, in the opinion of that great critic, Dr Lardner, were written about the year 63, although Dr Owen supposes the Gospel was written about ten years previous to that period. His writings are highly classical, and shew that he had enjoyed a liberal education; and nothing can be better adapted to the grand transactions he records than the elegant simplicity of his stile, which is plain, chaste, and perspicuous.

LULLY, Raymond, the celebrated alchymist, was born at Majorca in 1225, and, owing to the versatility of his attainments, was styled the *Enlightened Doctor*. He wrote with much subtilty upon the sciences; and fell a martyr to religion at Mauritania, in the 80th year of his age.

LUMBAGO. See Medicine.

LUMINARIES, a term chiefly applied to the sun and moon, also to comets, planets, and fixed stars, or other luminous bodies.

LUNA, one of the names of Diana; in chemistry it signifies silver. Lunar, belonging to the moon, as lunar year.

LUNATIC, a person affected with lunacy.

LUNATION, the space of time between one new moon and the next.

LUNDY ISLAND, an island in the British channel, and belonging to Devonshire; is three miles long and one broad, and almost inaccessible on account of the high rocks. Some sheep and cattle are reared on this island, and fowls and eggs are produced in great plenty.

LUNULA, or Lune, in Mathematics, a plain figure like a crescent or half-moon.

LUNENBURG. See Hanover.

LUNETTA, in fortification. See War. Also two small pieces of felt, made round and hollow, for covering the eyes of a vicious horse till his rider mount him.

LUNEVILLE, a town of France, in the department of Meurte. It contains an elegant church, a military school, a library, and an hospital and barracks. At this place was signed the treaty of peace between France and Germany in 1801.

LUNGS. See Anatomy.

LUNI-SOLAR YEAR, the space of 532 years, found by multiplying the cycle of the sun by that of the moon.

LUPERCALIA was a feast observed in Greece and Rome in honour of Pan. It was instituted by Evander, and was celebrated upon the Palatine mount by sacrifices, and by races of naked people with whips in their hand, with which they lashed all they met in their way.

LUPINUS, The Lupine, a genus of plants belonging to the Decandria class.

LUPUS, The Wolf. See Mammalia.

LUPUS, a southern constellation. See Astronomy.

LURCHER, a hunting dog of a mongrel breed.

LURE. See Sports and Pastimes.

LUSATIA, a margravate of Germany, bounded on the north by Brandenburg, on the east by Silesia, on the south by Bohemia, and on the west by Misnia, is 90 miles in length and 60 in breadth, and consists of Upper and Lower. Upper Lusatia is mountainous, while the Lower is moorish and boggy, yet fertile. The breed of cattle is considerable, and game is abundant. Cloth, linen, and other manufactures are established. The principal towns are Bautzen and Luckaw.

Bautzen, the capital of Upper Lusatia, is situated on the Spree. It has a citadel, and is a place of some trade. *Luckaw*, in Lower Lusatia, is chiefly inhabited by Vandals, who subsist by various manufactures.

LUSTRATIONS, a ceremony by which the ancients purified the people, cities, or fields, were of three kinds,—by fire, water, and air. When performed for particular persons, they were termed expiations, and the victims were called Piacula.

LUSTRE, a candlestick with branches, made of glass; also a gloss on silk, woollen, or stuff manufactures, and renewed by washing in soap, then in clear water, and, lastly, dipping them in alum-water cold.

LUTE, a stringed instrument, now out of use.

LUTHER, MARTIN, a distinguished reformer of Germany, born at Eisleben in Saxony, 1483, where he died, in the 63d year of his age, in 1546. His natural genius for learning and eloquence appeared at an early period, and his parents, who, though not in affluent circumstances, were, nevertheless, respectable, studied to impress his mind with a sense of religion. He at first directed his attention to the study of law, but, in consequence of a stroke of lightning, which killed his companion and threw himself down, as they were walking together, his thoughts took a new bent, and he retired to a monastery, that he might devote himself to the study of the Scriptures, and became peculiarly solicitous to learn the will of God and the nature of his duty. He soon after took priests orders, and began to lecture on philosophy in the university of Wittemberg. In a visit to Rome he became acquainted with the venality and corruption that prevailed in that court; and when Tetzel began to preach the papal indulgences at Wittemberg, he condemned his errors, and afterwards addressed a letter to his Holiness himself, mildly intimating, that he felt himself constrained to oppose the errors of popery. Pope Leo X. immediately summoned him to Rome, where, having refused to retract his opinions, he was summarily condemned as a heretic. After an interview with Cardinal Cajetan, and intercourse at various times with the Romish court, Luther still submissively pleaded the right of private judgment and liberty of conscience. Being, however, condemned by Leo as an inveterate heretic, he renounced all farther intercourse with the church of Rome, and in this he was encouraged by the offer of protection from several noble and powerful families in Franconia. In consequence of his writings and preaching, a great revolution began to take place in men's religious opinions; so that at length he attracted the notice of the imperial court and the emperor himself; and, that he might not be condemned unheard, the emperor and princes of the diet resolved to protect him. But he was again denounced as a heretic, and all persons prohibited from either printing, selling, or reading his works, or from offering him protection.

In 1527 he was seized with some peculiar bodily disease; and about this time a Polish physician, a Jew, was detected in attempting to take away the life of the reformer by poison, in which, however, he happily failed.

Luther was the author of various treatises, and, among others, of that on the Popish Divinity, Views of Chastity, Institution of the Ministerial Office in the Church, on the Office of the Supreme Magistrate, and Worship of the Eucharist; also of the treatise *De Servo Arbitrio*, as a reply to Erasmus, and of a Translation of the New Testament in German. For further particulars respecting the life of this great reformer, see Reformation, Mosheim's Church History, Bower's Life of Luther, Viller's Essay on the Reformation, translated by Mill, and Melchior Adam *in Vita Lutheri*. For an account of the many scandalous falsehoods invented against Luther, see Bayle's Dictionary.

LUTON, a town of Bedfordshire in England, situated on the river Lea, is only remarkable for its church. The population in 1811 was 3716. Straw hats are manufactured here to a great extent.

LUTTERWORTH, a town of Leicestershire in England, situated on the river Swift, is built of brick, and contains three main streets. In the parish church is a curious pulpit, in which John Wickliffe used to officiate, and the garment he wore at his death covers the communion table. The population in 1811 was about 1850. The cotton manufacture is very extensive; and also the stocking trade.

LUTZEN, a town of Upper Saxony in Thuringia, is situated on the river Elster, and famous for a battle fought in 1632, in which Gustavus Adolphus, king of Sweden, was killed.

LUXATION. See SURGERY.

LUXEMBURG, a duchy of the Netherlands, situated in the forest of Ardennes, and bounded on the east by Treves, on the south by Lorrain, on the west by Champagne, and on the north by Liege and Limburg. It is mountainous and woody, but productive of corn and wine, and abounds with mines of iron. The Moselle, Sour, Ourte, and Semoy, are the principal rivers. Luxemburg submitted to the French in 1795, and was ceded, by the congress of Vienna, to the king of the Netherlands in 1815.

Luxemburg, the capital, is well fortified, and divided by the Else into the Upper and Lower towns, the former being situated on a rock and the other on a plain.

LUXURY, a wasteful indulgence in dress, eating, or any kind of extravagance; useful if limited to a few of the higher and more opulent ranks, but ruinous, in a national view, when it becomes general.

LYCÆUM, a celebrated academy, in which Aristotle taught philosophy, at Athens.

LYCAONIA, a small province of Asia Minor, where the Christian religion was propagated by Paul and Barnabas.

LYCURGUS, the celebrated Spartan lawgiver, son of Eunomes. In early life he retired to the island of Crete, where he devoted himself to the study of the law of nations; and on his return to his native country he totally new-modelled the constitution, compiled a code of jurisprudence, selected from the best laws made by Minos and others, prohibited the use of gold and silver, and reduced all the citizens to a state of equality, inculcating the strictest temperance and moderation, and the most rigid discipline. In consequence of this, his countrymen soon became illustrious among the surrounding nations, and their name has been handed down as of a race of invincible warriors. During several ages his countrymen celebrated a festival in honour of their illustrious legislator, and his laws have been greatly admired by all historians.

LYDIA, a kingdom of Asia Minor, known also by the name of Meonia. This country was ruled by the descendants of Hercules above 500 years, and Crœsus was their last king. They are said to have introduced the art of coining gold and silver, for facilitating trade and commerce.

LYME-REGIS, a sea-port town of England. See Dorsetshire.

LYMINGTON, a market-town of England. See Hampshire.

LYMPH and LYMPHATICS. See Anatomy.

LYNN-REGIS, a market-town of Norfolk in England, situated on the river Ouse, contains many handsome houses, and the principal public buildings are two churches and a custom-house. The population in 1811 was upwards of 10,000. On the first Monday of every month the mayor and aldermen meet, to prevent law-suits and determine all disputes amicably. This is called the *feast of reconciliation*, and was first established in 1588.

LYNX. See Astronomy and Mammalia.

LYONS, a large and handsome city of France, on the confluence of the Rhone and Saone. Previous to the revolution it was reckoned the second city for trade and commerce in the kingdom, and the archbishop of Lyons was the primate of France. It is adorned with numerous palaces and fine buildings, and, before the revolution, had four abbeys, fifty convents, an academy of sciences and fine arts, three public schools, and a noble cathedral of Gothic structure. Its population exceeds 100,000.

LYRA. See Astronomy.

LYRE, an ancient musical instrument invented by Apollo, or, according to others, Mercury, Orpheus, and Amphion; and is supposed originally to have had only three strings, which were afterwards increased in order to complete the octave, and, lastly, it is said to have had ten. At first it was constructed in the form of a tortoise, and is supposed to have been invented by Mercury in consequence of his having struck his foot against a tortoise-shell, within which the nerves and cartilages had been contracted by the heat of the sun, and become sonorous. From this instrument, it is supposed, arose the Welsh harp, or modern lyre.

LYRIC POETRY, a species of verses sung by the ancients to the harp or lyre. It now denotes any kind of poetry composed for music.

LYSANDER, the renowned Spartan conqueror of Athens, who insensibly corrupted the morals of his countrymen by the immense treasures he brought to Lacedemon.

LYSIMACHIA, Loosetrife, a genus of plants belonging to the Pentandria class.

LYTTLETON, George, eldest son of Sir Thomas Lyttleton, afterwards Lord Lyttleton, was born at Hagley in Worcestershire in 1708, and died at the same place in 1773. He was eminently distinguished by his classical learning and poetical talents. His earliest productions were his Verses on Blenheim, his Persian Letters, and his Progress of Love. He was representative of the borough of Oakhampton in Devonshire in 1730, and strenuously opposed the administration of Sir Robert Walpole in Parliament. Being appointed principal secretary to Frederick prince of Wales, he continued intimate with him till the time of his death, and is supposed to have been his adviser in all matters of importance. One of the best of his poetical pieces is a Monody on the Memory of his first wife, Lucy, the daughter of Hugh Fortescue, Esq. a lady of a most amiable character. He was the intimate friend of Thomson, Dr Young, Fielding, Voltaire, Hammond, and Pope. Of his prose compositions, perhaps the most masterly is his Dissertation on the Conversion of St Paul, published in 1747, which Dr Johnson considers as unanswerable, even by the greatest infidel. He succeeded his father in his titles and estate in 1751. Having filled the appointment of cofferer of the household and privy-councillor, and chancellor of the Exchequer, he was at last promoted to the peerage, and took his seat in the house of Lords by the style and title of Lord Lyttleton, baron of Frankley, in the county of Worcester. After this period his time was chiefly devoted to literary pursuits, and he lived chiefly in retirement. His Dialogues of the Dead, and his History of Henry II. have established his character as a respectable prose writer. His works were collected and published after his death, by George Ayscough, his nephew, in one volume 4to.

M.

M the twelfth letter of the alphabet, is a consonant, and pronounced, like *b*, by the compression of the lips, as *mine*. Quintilian remarks, that *m* occasionally terminates Latin words, but in the Greek it is always changed into *n*. As a numeral, M denotes a thousand, and with a dash thus M̄, a thousand times a thousand. It is sometimes used as an abbreviation for Manlius, Marcus, and other Roman names. M. A. is often used for *Magister Artium*, or master of arts, A. M. for *Anno Mundi*, and MSS. for *Manuscripts*. In astronomy it stands for meridian; and in medical prescriptions for *misce*, mix, or for a maniple or handful.

MACAO, an island on the coast of China, about a league in length and half a league in breadth, with a spacious harbour, is well known to European navigators. The town is situated on an eminence at the mouth of the river Tigris, and consists of three parishes, in which are a cathedral and twelve churches. A Chinese temple, composed of three buildings one above another, and which is approached by a stair cut out of the rock, is an object of considerable curiosity. Likewise the cave in which the celebrated poet Camoens wrote his Lusiad, said to be situated here in a garden a little above the lateral eminence of the town, is worthy of notice. The population is estimated at from 12,000 to 15,000, and consists mostly of Chinese, although the Portuguese sometimes also use their authority in the government. Macao is an Episcopal see, and was built in 1585 by the Portuguese, who, it is said, established the earliest European intercourse with China. See Staunton's *Embassy*, Vol. II. Krusenstern's *Voyages*, Vol. II. and Horsburgh's *Sailing Directory*.

MACARONIC, or MACARONIAN, applies to a sort of burlesque poetry, composed of extravagant words from various languages, and took its name from a kind of confection composed of coarse oat-meal, sugar, white of eggs, and sweet almonds.

MACASSAR, or MUNGKUSAR, the chief settlement belonging to the Dutch in the island of Celebes. The town is situated near a river, and the houses are built of wood, which are entered by ladders, and the roofs are covered with large leaves. The harbour is excellent, and well defended by Fort Rotterdam. This place was surrendered to the British in 1810. The Chinese inhabitants occupy a street by themselves.

Macassar poison is a species of gum which exudes from a tree, and is applied by the natives in the island of Celebes to their darts and arrows.

MACCABEES, two books of Scripture in the Apocrypha, containing a history of their wars against the Assyrian kings in defence of their religion and liberties.

MACCHIAVELLI, NICHOLAS, an eminent political writer of Italy, was born at Florence in 1469. He was secretary and historiographer to the republic of his native place, and was engaged in different embassies to Louis XII. of France, the emperor Maximilian, and Pope Julius II. His *History of Florence* from 1205 to 1494, and his *Discourses upon the first Decade of Livy*, have been, for the just remarks they contain on the principles of popular government, generally esteemed; but his political views in the work *Del Principe* have excited surprise regarding his principles and motives, and proved a source of controversy. He died in 1527.

MACCLESFIELD, a market town of Cheshire in England, situated on the declivity of a steep hill, is handsomely built, and consists of three principal streets. The most remarkable buildings are two churches, a grammar-school, and three alms-houses. The population in 1811 was 12,299. Macclesfield contains 30 mills for the throwing of silk, a manufactory of fustians and silk, and a brewery. Copper and brass are smelted in the vicinity, where coal, stone, and slate are very abundant. See *Beauties of England and Wales*, Vol. II.

MACDUFF, a sea port town of Banffshire in Scotland, and belonging to the earl of Fife, who has improved the harbour at great expense, and also erected a fine chapel, contains 1200 inhabitants, who are engaged in the fisheries. Prior to 1732, this place was merely occupied by a few fishermen who lived in huts.

MACE, an ancient military weapon, in figure like a chocolate mill. In modern times it is formed of copper or silver gilt, highly ornamented, and used as an ensign of authority in Great Britain. The pioneers of the trained bands formerly carried staves similar to the ancient maces, and which were armed with spikes.

Mace, the membraneous substance which forms the second covering of the kernel of the nutmeg. See MATERIA MEDICA.

MACEDON, or MACEDONIA, an ancient kingdom of Greece, which was bounded on the west by the Ionian sea, on the north by the Scardian mountains and the river Strymon, on the east by the Ægean sea, and on the south by Thessaly and Epirus. It extends about 160 miles from north to south, and 220 from east to west; is finely diversified, remarkably healthful and productive, and contains rich mines of gold and various other metals. In the reign of Philip, the father of Alexander, when the boundaries had been extended to the eastward, the whole consisted of three provinces, Pieria, Chalcis, and Pangæus. Pieria, the southern province, extended to the borders of Thessaly and mount Pindus, and presented such variety of delightful scenery that it was supposed the favourite resort of the Muses, who were hence called Pierides. Chalcis, the middle region, was extremely fertile, and happily situated for inland navigation; while the expansive mountains of Pangæus abounded in timber as well as veins of gold and silver, the annual produce of which was valued at L.200,000 Sterling. Beside the mountains of Pangæus, the Hæmus, Athos, and Olympus have been highly celebrated. The principal rivers were the Drilo, Pangasus, Apsus, Aliacmon, Axius, and Strymon. Agaia, or Edessa, was the metropolis.

This region was anciently denominated Æmathia, from Æmathius, one of its princes, and is said to have been named Macedon from Macedo, a descendant of Deucalion. Caranus, a native of Argos, was the first who established a permanent government. This he effected about 800 B. C. Nothing very extraordinary is related of the succeeding kings until the time of Philip and his son Alexander, whose splendid atchievements not only exalted the glory of Macedon, but had a wonderfully beneficial effect upon the political world, which has even descended to modern times. (See ALEXANDER, GREECE, and PERSIA.) This powerful kingdom, which has been the admiration of the world, and which kept the eastern nations in awe, was at length reduced by the Romans, from whom again it was wrested, in 1357, by Bajazet, the Turkish sultan; and it still remains subject to the court of Constantinople.

MACARTNEY, GEORGE, Earl of, a native of Ireland, was born at the family mansion of Lissanoure, and placed, during his younger years, under the care of a clergyman, with whom he had but little scope for the indulgence of his reading propensity, which was accordingly confined to the subject of heraldry. In his thirteenth year he became a fellow commoner of Trinity college; and, taking his first degree in 1759, he removed to London, where he became acquainted with Mr Burke and other eminent characters, and was entered of the Middle Temple. Having, in 1764, given great satisfaction by his conduct as envoy-extraordinary to the empress of Russia, he was afterwards appointed on a mission to the court of Pekin, with a salary of L.15,000 per annum. This unsuccessful embassy being completed, he returned to England in 1794, and was advanced to the title of Earl of Macartney in the county of Antrim.

MACERATION denotes the process of dissolving a solid body, or the infusion of substances for the extraction of their virtues.

MACHINERY applies to any thing which augments or regulates moving powers, or which is adapted to produce motion. See MECHANICS.

MACKENZIE, SIR GEORGE, a celebrated lawyer, and author of various works, was born at Dundee in 1636, and prosecuted his studies at the university of Aberdeen and St Andrews, whence he removed to Bourges in France, for the study of civil law. Returning to Scotland, he was admitted to the bar, and soon rendered himself conspicuous by his superior abilities. His great energy of mind was fully evinced in pleading the cause of the marquis of Argyle, who, in 1661, was impeached for high treason; and he was afterwards appointed a judge in the criminal court. In 1674, he was knighted and made king's advocate, and one of the lords of the privy-council of Scotland. As public prosecutor in those troublesome times, Sir George had obvious cause for severity; but the term *blood-thirsty* he is supposed in some degree to have merited, by his harsh measures against the Covenanters. The abrogation of the penal laws by James II. led him to resign the office of lord advocate, which, on a change of measures, however, he afterwards resumed; but, taking disgust at the aspect of political affairs in 1688, he finally relinquished all his offices in Scotland, and removed to the university of Oxford, of which he was admitted a student in 1690. He died at London in 1691.

The Advocate's Library was founded by Sir George Mackenzie in 1680. Besides his numerous works on law, politics, and literature, which were published in two editions, folio, in 1716, he prepared a manuscript History of Scotland from the year 1660, which was lately discovered among the waste papers of a grocer in the Canongate, Edinburgh, and by him communicated to the Rev. Dr M'Crie, who published it.

MACKEREL. See ICHTHYOLOGY.

MACKYNLETH, a regular and handsome town of Montgomeryshire, in North Wales, seated at the junction of the rivers Dulas and Dovey. It contains a church and town-hall. A tannery, and also a manufacture of flannel, are carried on to a considerable extent. Owen Glendower accepted the crown of Wales at this place, and assembled a parliament in 1402. See Beauties of England and Wales, Vol. xvii.

MACLAURIN, COLIN, an eminent mathematician, was born at Kilmoddan in Scotland, in 1698; and being sent, in his eleventh year, to the university of Glasgow, he made such rapid progress in learning as enabled him to obtain his degree of master of arts with approbation at the age of fifteen years. So singular was his turn for mathematics, that, in his twelfth year, he, in a few days, acquired a knowledge of the first six books of Euclid without an instructor. After quitting the university, he still devoted himself to study; and in 1717 he obtained the professorship of mathematics in the Marischal college of Aberdeen. During the vacation of 1719, he went to London, where he was warmly received by Dr Hoadly, Dr Clarke, and Sir Isaac Newton; and also became a member of the Royal society. In 1721, he again visited London, and formed an intimacy with Martin Folkes, Esq. president of the Royal society. The following year Mr Maclaurin accompanied the eldest son of Lord Polwarth to France, where he wrote his memoir on the Percussion of Bodies, which obtained for him the prize of the Royal academy of Sciences in 1724. The death of his pupil occasioned his return to Aberdeen; and, in 1725, he was appointed assistant to Mr James Gregory, professor of mathematics in Edinburgh.

In 1733, Mr Maclaurin married the daughter of Mr Stewart, solicitor-general of Scotland, by whom he had four children, who survived him, and one of whom was afterwards Lord Dreghorn in 1787. The plan for opening a passage from Greenland to the South sea by the north pole, was long a favourite scheme of Maclaurin's; and when memorials on this subject were laid before Parliament in 1741, he had the honour of being consulted; but, before his memorial was finished, he had to regret the circumstance of the premium proposed by government being limited to the discovery of a north-west passage, he being persuaded that if any opening could be found it must be near the pole. Mr Mauclaurin actively exerted himself in fortifying the city of Edinburgh against the rebels in 1745, and was consequently subjected to fatigue and exposure, which eventually terminated his valuable existence. He died in 1746 at the age of 48 years. Besides his celebrated work on Fluxions, and many valuable essays on mathematical subjects, published at various times in the Philosophical Transactions from 1729 to 1743, he was author of a treatise on Algebra, and an account of Sir Isaac Newton's Philosophical Discoveries, published after his death.

Mr Maclaurin's merits as an able philosopher and a virtuous man, have been justly appreciated. He was ever ardent in the pursuit of useful discoveries, and a liberal patron of genius, by whomsoever it was evinced.

MACON, a town of France, and capital of the department of Saone and Loire; has a fine quay with some handsome houses; and is remarkable for confections and excellent wines. A society of agriculture and the arts has been established here. The population is 10,807.

MACPHERSON, James, an eminent poet and historian, was born at Ruthven in Scotland in 1738; and having obtained a knowledge of the Latin and Greek languages at his native village, he removed to King's college, Aberdeen, after which he, for some time, taught the parish-school of Ruthven. In this situation he had opportunities of indulging his predilection for poetry, and composed for publication a variety of pieces, the best of which were the "Cave" and the "Night Piece." In 1759, several of his translations of Gaelic poetry were received with great enthusiasm, particularly by Dr Blair, who, after much entreaty, succeeded in obtaining translations from him of other fragments; and the whole was published, with Dr Blair's preface, in 1760. A subscription was now raised, which enabled Mr Macpherson to pay a visit to the Highlands for the purpose of collecting more fragments; and with these he went to London, where, in 1762, he published "Fingal," an Epic Poem, in six books, with other poems; and in the year following appeared "Temora," in eight books. The publication of these works proved highly advantageous to Mr Macpherson, though doubts were entertained by many respecting the authenticity of what was ascribed to Ossian, which, indeed, the publisher's own conduct in some degree tended to confirm.

The appointment of private-secretary to Captain Johnstone, afterwards governor of Pensacola, proved a fortunate circumstance to Mr Macpherson; for he likewise obtained the situation of surveyor-general of the Floridas, with a salary of L.200 per annum, which was continued to him after his return to England in 1766.

His Introduction to the History of Great Britain and Ireland appeared in 1771; about which period also was commenced his translation of Homer's Iliad, which was afterwards published in two 4to vols. In 1775, the History of Great Britain, from the Restoration to the Accession of the House of Hanver, was published, and brought him L.3000 for the copy-right.

The animadversions of Dr Johnson, in his Tour to the Hebrides, upon the translation of Ossian, excited the irritability of our author, whose fortune and reputation, however, were well supported by his various publications. The talents of both these powerful opponents were afterwards employed by the ministry in favour of the war against the liberties of America. About the year 1779, Mr Macpherson was chosen agent to the unfortunate Nabob of Arcot, and in 1780 he was elected member of Parliament for the burgh of Camelford. Having acquired a considerable fortune, he, in 1790, purchased properties in the county of Inverness, on one of which, Belleville, he built a spacious mansion. Here he spent a few months annually with the view of recruiting his health, and he died in 1796, in the 58th year of his age. His remains were removed to Poet's Corner, Westminster Abbey, for interment; and a handsome monument was raised to his memory on the estate of Belleville.

The political principles of Mr Macpherson no doubt exposed him to the rancorous attacks of some; yet he enjoyed the warmest friendship of many of the most eminent characters of his time, among which were the Reverend Principal Robertson, David Hume, Esq. Dr Blair, Dr Adam Ferguson, and Dr Douglas, bishop of Salisbury.

Respecting the Poems of Ossian, which are now translated into almost all the languages of Europe, it is generally supposed that Mr Macpherson was, in some degree, the author as well as the translator of them, at least in as far as the arrangement and connection of them are concerned; and indeed Dr Blair has aptly remarked on the subject, that "a translator who cannot equal his original, is incapable of expressing its beauties." The sum of L.1000 was bequeathed by Mr Macpherson for the purpose of publishing the Poems of Ossian in the original Gaelic, which acccordingly appeared in 1807, with a literal translation into Latin by Robert Macfarlane, and a Dissertation on their Authenticity by Sir John Sinclair, 3 vols. 4to.

MACROBIUS, Ambrosius Aurelius Theodosius, an ancient Latin writer who flourished at Rome towards the close of the fourth century, and is supposed by Erasmus to have been a Greek, though it is not known whether he was a Christian or a Pagan. He prepared Commentaries upon Cicero's *Somnium Scipionis*, and seven books of *Saturnalia*, which comprise various subjects. These curious works have been frequently printed with the addition of a treatise entitled "*De Differentiis et Societatibus Græci Latinique Verbi*. Macrobius did not profess to be an original writer; and, from the freedom with which he makes use of the materials, and even language of others, he has been treated as a plagiarist by some modern authors.

MACULÆ, in astronomy, are dark spots which appear on the surfaces of the sun, moon, and even some of the planets.

MADAGASCAR, the largest of the African islands, situated between 43° and 51° E. Lon. and 12°

and 26° S. Lat. It extends about 900 miles from north to south, and from 200 to 300 miles in breadth, and was discovered by the Portuguese in 1492.

Aspect, Climate, &c.—This island is traversed by a range of high mountains, two of which rise 1800 fathoms above the level of the sea. The scenery in the elevated quarters is astonishingly picturesque, while the spacious meadows, watered by meandering streams, and interspersed with trees and beautiful flowers, afford excellent pasture to numerous herds of cattle and sheep, and seem as if cultivated by the hand of art. Notwithstanding the great diversity of hills, lakes, and marshes, about 200,000,000 acres of land are fertile in a great variety of fruit and other produce. The climate in different parts of the coast, particularly during the prevalence of the north wind, is very pestilential; but the sourhern coast, together with the interior of the island, is more favourable to health.

Rivers.—The rivers, as might be expected in an island of so great extent, are numerous, and several of them are navigable for large vessels. Fanshere, one of the most remarkable, rises in the Manghabey mountains, and watering many fine vallies in its course, supplies the extensive lake of Amboule, and afterwards discharges itself into the ocean; besides which, the Manghasia, the Mandrarey, the Manatingha, the Mananghera, the Ongleby, the Linguebate, and the Yonghelake, are the most considerable.

Natural History.—This island contains many valuable iron mines. In the mountains are found large blocks of rock-crystal; likewise gold ore, sapphires, topazes, and emeralds. But the mineralogical productions of Madagascar are not yet fully known, The vegetable productions constitute the main wealth of the country. Extensive forests also abound, with an immense variety of trees, which serve for ship-building and various other purposes, and which supply the inhabitants with useful gums, and particularly that singular substance called Indian rubber. Dye-woods, medicinal and other curious plants, the papyrus, the cotton and nutmeg trees, are likewise to be found here in extraordinary abundance. The fruits are chiefly cocoa-nuts, figs, pine-apples, tamarinds, pomegranates, lemons, oranges, and vines; besides which, there are sugar-cane, bananas, yams, and many other esculent plants. Among the other productions may be enumerated flax, hemp, and grain, wax, honey, and silk. The principal animals belonging to the natives are buffaloes, wild boars, dogs, monkies, and porcupines; and the breed of horned cattle, of sheep, goats, and hogs, is both excellent and abundant. Of the feathered tribes, may be mentioned eagles, storks, pelicans, guinea-fowl, wild turkeys, and pheasants. On the coasts are found various species of excellent fish, and in the rivers are crocodiles of formidable size and great ferocity. Insects are numerous, and many of them extremely troublesome; serpents also sometimes appear; but the only poisonous creature in the island, whose wound is mortal, is the water scorpion.

Inhabitants, &c.—Madagascar was supposed about 40 years ago to contain a population of 4,000,000, or, according to another statement, 3,000,000. The natives are divided into numerous tribes, according to their supposed origin. Of these tribes the Rhoandrians, or royal tribe, exercise authority as chiefs, and are distinguished by their wearing a red woollen cap. In the interior of the island, the Kinios, a singular race of dwarfs, are said to exist peaceably by themselves, and to be very industrious; but respecting this race some doubts are still entertained. The natives of Madagascar are tall and well proportioned, and of an olive or black complexion, with black hair. The females are represented as very engaging in their manners, and to be treated by the men with a great degree of complaisance. Their chief employment consists in the spinning of flax; and preparing of thread from the bark of trees. The Madagasses, though not wanting in capacity, are generally indolent; but those on the coast and in the interior, as fishermen, are considered extremely expert. Their houses, which are small, are formed of wood, and covered with plantain leaves; and, having no chimneys, they are continually filled with smoke. The articles of furniture are simple; their diet consists of milk, rice, fish, and fruits; and the dress of most of them consists in little more than ornaments, such as ear-rings, necklaces, and bracelets. Polygamy seems to be chiefly confined to the higher classes; and although the men are allowed to marry as many females as they can support, yet only one is esteemed to be the lawful wife. Singing and dancing constitute their principal amusements. In their wars they arrange themselves so as to attack the enemy by surprise, when they commonly exercise the most savage barbarity. Their weapons are shields, lances, and darts; and some of them even make use ef fire-arms. Coin being almost unknown except on the coast, the trade among the natives themselves is conducted by way of barter. The manufactures are earthenware and iron utensils, besides which they prepare paper from the papyrus, pens from the bamboo, and ink from the bark of the Arandrato tree. The petty kings belonging to this island are numerous, whose riches consist chiefly in cattle and slaves, and they carry on against each other almost perpetual war.

Religion, &c.—The natives of Madagascar are remarkably superstitious, and in their religion they seem to have adopted some of the Jewish ceremonies, such as circumcision, the observance of the seventh day, and abstinence from pork; but they do not appear generally to believe in a future state, though they profess to entertain a great veneration for the memory of departed friends. To the tenets of Mahomet they pay very little respect; and their prayers and sacrifices are offered only to the evil spirit. One of their religious ceremonies, however, is worthy of notice, as it resembles that of the Eucharist among Christians. A number being assembled together round a table covered with banana leaves, on which are placed three slices of bread, with pieces of the flesh of the sacrifice, and a bottle of wine, the master of the house implores a blessing on his family and friends, when the bread is broken, and the provisions are distributed among the company. The ombiasses or learned men among them, who are the oracles as well as the physicians of the people, employ their overpowering influence to degrade and not enlighten the mind; and to them is owing that shocking practice among the natives of exposing those children to destruction who have the misfortune to be born on certain days, which by them are denominated and believed to be unlucky.

Settlements.—Comparatively little is known of the topography of Madagascar, though no less than twenty-eight of its provinces are enumerated. *Fort Dauphin* in the south, and *Foul Point* in the north of the island, are best known to Europeans. The former is seated on an eminence 150 feet above the level of the sea, and surrounded with walls. It has good anchorage, but the entrance into the harbour is intricate and difficult. The river Fanshere passes to the sea within two leagues of this settlement. *Foul Point* is a remarkably convenient port for vessels. The entrance on the north is 50 fathoms wide, and the greatest rise or fall of the tides is four or five feet. An extensive reef of coral rocks appears above the water during low tides, on which are found various marine curiosities, such as madrepores, black coral, sea-stars, and shells. Oysters are also found in great abundance.

History.—Since the year 1642, the island of Madagascar has been an object of consideration with the French, who formed their first settlement at the province of Anossi, and that of Fort Dauphin, in 1667. They have also attempted settlements at Foul Point, St Mary, and the Bay of Antongil. Benyowski, an indefatigable adventurer, obtained the command of a French expedition, and arrived at the bay of Antongil in 1775, with the view of occupying Madagascar; but his ambitious views were ill directed, and Viscount de la Croix was sent to oppose his measures in 1786. The Portuguese have been frustrated in their attempts to settle in the island, by a set of ferocious pirates who infest the Comoro islands. The missionary societies have proposed forming a settlement for improving the morals of the people of Madagascar. This island is now attached to the British empire as a dependency of Mauritius. See Rochon's *Voyage to Madagascar*, Flacourt's *Account of Madagascar*, and a work entitled *The Great Dictionary of Madagascar*.

MADDER. See Dyeing.

MADEIRA, the principal of a group of islands in the Atlantic; is subject to Portugal, and is about 30 miles in length, and 16 at its greatest breadth. It enjoys a temperate climate, and the soil, where duly cultivated, is highly productive; but agriculture is not much regarded. The forests abound with excellent trees, among which are the *Lauris Indica*, the *Olea excelsa*, which becomes remarkably hard, and the *Erica arborea*, or heath tree. Besides these, pine, chesnut, yew, and other trees are very common. The produce consists chiefly of Indian corn, wheat, rye, sugar, and coffee; pine-apples are likewise abundant, and cabbages grow to an astonishing size, some of them weighing 100 libs. This island is particularly celebrated for wine, of which above 40,000 pipes are yearly exported, together with walnuts, chesnuts, and citrons.

Madeira must have suffered severely from volcanoes at some early period; for besides other evidences, the remains of two craters are to be seen, one of them four miles in circumference. In the elevated part of the island, Pico Ruivo rises to the height of 5,068 feet; and Paulo da Serra, a sort of table land, extends westward from it about 20 miles. The island is watered by three rivers flowing from the Pico Ruivo, and also by other streams. Fruits and tame fowl of almost every kind are very abundant. The natives are a mixed race, and of a tawney colour, and the population is about 100,000.

Funchal, the chief town, well fortified and regularly built, contains a superb cathedral, a custom-house, several churches, an hospital, and other buildings. The forts are St Jago, Lorenzo, the Peak Castle, and a fourth one situated on the Low Rock, and these are all connected by a strong wall towards the sea.

The Madeiras include Porto Santo on the north-east, and the Desertas on the south-east, of the principal island. The extent of Porto Santo is ten miles in length, and nearly three in breadth, and the population is above 3000. Wine is the produce. The Desertas are rugged and uninhabited, except by goats and rabbits. See Milburn's *Oriental Commerce*, Vol. I.

MADNESS. See Insanity and Medicine.

MADRAS, the chief settlement of the British East India Company. See Hindostan.

MADREPORA, a genus of submarine animals of the order Zoophita. See Helminthology.

MADRID, the capital of Spain, has an elevated situation nearly in the centre of the kingdom, and is about two leagues in circumference. It contains no less than 506 streets, many of which are well laid out; and of the numerous squares, the most important are the square of the palace, the Puerto del Sol, the square of the mansion-house, and the Plaza Mayor, which is very elegant, and much frequented. The public buildings are the royal palace and the Buon Retiro, situated at the opposite extremities of the city, the custom-house, the post-house, the state-prison, and 133 churches. Some of the gates, which are 15 in number, are remarkably grand, and worthy of notice. Several promenades, the most celebrated of which is the Prado, are much frequented by fashionable company. Madrid contains many excellent institutions for the education of youth, and the cultivation of science and the arts, as well as various hospitals for the relief of the sick, the indigent, and the unfortunate. The royal library, founded in 1712, is said to contain more than 100,000,000 printed volumes, besides manuscripts; and the cabinet of natural history, formed by Charles II., and well furnished, together with its library, is at all times accessible to the public. This city is under the jurisdiction of the grand vicar of Toledo. It consists of eight districts, and contains fifteen parishes, with a population, including the garrison, of about 200,000. The manufactures and commerce are inconsiderable, and supplies are consequently obtained from the surrounding provinces. The inhabitants of Madrid, though somewhat arrogant and affected in their manners, are, however, very polite in their intercourse with strangers. Their amusements consist chiefly in the savage entertainment of bull-fights and of religious processions, and in frequenting the coffee-houses, promenades, and squares. The river Manzanarez flows near the city, and is adorned with bridges and agreeable walks.

Madrid was entered by Joseph Buonaparte as king of Spain in 1808, and it afterwards surrendered to the French under Napoleon. The allied army occupied it in 1812, and Ferdinand VII. re-entered his capital in 1814. It has had some changes of masters since that period, in consequence of the various events of the recent civil war.—See Temple's *Journey in Spain*, Link's *Travels*, and Laborde's *View of Spain*.

MADRIGAL, a short amorous kind of poetry, composed of a number of free and unequal verses, consisting of some tender and delicate idea, beautifully and simply expressed. It is also applied to the music adapted to such verses.

MAESTRICHT, a fortified city of the Netherlands, stands at the junction of the Jeker and the Maese; is regularly built, and contains several churches, a town-house and a library. Fort St Pierre, on the south side of this place, can accommodate 14,000 men. Maestricht communicates, by a bridge, with the town of Wyck. In the vicinity are considerable quarries and subterraneous passages. The population is 17,963.

MAGAZINE, (*Machsan*, Arab. a treasure,) a place for arms, ammunition, provisions, and other military stores, which are necessary in time of war to enable the inhabitants, or garrison, to defend themselves during a long siege. On ship board, it is an apartment constructed in the fore or aft part of the hold for preserving the gunpowder, and is strongly secured against any accident from fire, being lighted, when required, with a candle, or lamp, in the light-room contiguous. The artillery magazine, during a siege, is generally constructed behind the battery, and under ground, having its roof and sides well secured, and a double passage sunk from the magazine to the battery, the one for entrance, and the other for exit, to prevent confusion.

MAGAZINE, Powder, the depository for very large quantities of powder. These magazines have been variously constructed; but one point of essential importance in the construction of them is always to be kept in view, which is, as much as possible to prevent dampness; and it is likewise necessary that they be arched, and *bomb-proof*. For further particulars respecting the construction of powder-magazines, see Hutton's *Miscellanea Mathematica*.

MAGAZINES, Literary, a species of periodical publications, on various subjects, in prose and verse. The first production of this kind appeared in 1731, in the Gentleman's Magazine, which was conducted by Mr Edward Cave. Before that time, periodical publications contained little else than political transactions and occurrences foreign and domestic; but this species of publication furnished an opportunity for every kind of discussion and enquiry. The multifarious subjects treated of in these periodicals have been highly beneficial in diffusing a general taste for reading throughout the nation; and, being the productions of young authors, frequently possessed of the greatest genius and literary merit, they were greedily sought after by the public, and eminently calculated both for instruction and amusement. In these periodical works, vast numbers of observations, new facts, and useful hints have been preserved, which otherwise in all probability would have been forever forgotten or lost; so that this kind of publication may be looked upon as forming a new epoch in the literary history of this kingdom.

MAGDEBURG, a fortified town of Prussia, in the circle of Lower Saxony, is situated on the Elbe, with a population of 32,000. This town contains several public buildings, among which are the college, a palace, and a superb cathedral, within which is the mausoleum of Otho the Great; likewise the citadel, with an arsenal, and the cells where Baron Trenk and others were confined. Besides institutions for the education of youth, a school of arts is established, together with cabinets of painting, and a library. The manufactures consist chiefly of woollen and silk stuffs, stockings, gloves, hats, cotton goods, porcelain, and tobacco. The articles of commerce are grain, fruits, skins, and various other articles of merchandise. In the convent of Bergen is a handsome library, together with a collection of paintings.

MAGELLAN, Straits of, a passage between the Atlantic and Pacific oceans, bounded on the south by Terra del Fuego, and on the north by Patagonia. It was discovered in 1520, by Ferdinando Magellan, and has since been visited by different navigators; but it is now found more safe to sail through the strait of Le Maire, and round Cape Horn.

MAGGOT, the Fly-Worm, *Musca*. See Entomology.

MAGGIORE, Lake of, situated on the borders of Italy and Switzerland, extends 15 or 16 leagues in length, and two and a half leagues in breadth, and is of considerable depth. Its elevation above the level of the sea has been variously stated, at from 732 to 762 feet. The scenery of this lake is remarkably grand. The supply of water proceeds from various mountain streams, the principal of which is the Tesino.

MAGI, or Magians, originally an ancient sect of religious persons among eastern nations, and particularly in Persia, who, among other opinions, maintained the existence of two principles, the one the cause of all good, and the other the cause of all evil. This sect, feeling an aversion to the adoration of images, worshipped God by fire only, considering this the most glorious symbol of the good god Oromasdes,—as darkness was the symbol of the evil god Arimanius.

Zoroaster in some degree improved upon this idea, and maintained that there was only one Supreme independent Being, under whom were two principles, or angels,—the one of good and the other of evil; that between them a constant struggle will be maintained to the end of the world; and that then the evil angel and his disciples shall be consigned to a place of everlasting darkness, but the good angel and his disciples shall inherit a world of their own, and be finally happy in everlasting light. This religious sect still continues, under the name of Gabres in Persia, where, with the greatest possible anxiety, they superintend the sacred fire, to prevent it from being ever extinguished. The priests of this sect having been the most distinguished philosophers and mathematicians of the country in which they lived, were therefore denominated magi, or learned men, which may be considered as equivalent terms. Magic was the same with the Persians as philosophy among the Greeks; whence the three wise men in the east, that came to adore the Saviour of the world, were called Magi. The term, however, has been commonly used in a bad sense, and applied to those persons who practised the black art and dealt with familiar spirits. See GABRES.

MAGIC, in its primary sense, signifies the secret operations of natural powers, and originally comprehended the knowledge of the more sublime parts of philosophy, intending nothing more than the application of natural or physical power to the production of wonderful but yet natural effects. In time, however, the ancient philosophers likewise engaged in the study of astrology, sorcery, and divination, when the term Magic assumed a different meaning, and came to signify the science and diabolical art of putting in action the power of evil spirits and departed souls. Magic has therefore been divided into three kinds, *celestial*, *natural*, and *goetic*, or superstitious.

Magic, Celestial, comprehends judicial astrology, which ascribes to evil spirits, or genii, a certain power of dominion over the celestial bodies or planets, and to planets a certain power and influence over the minds and dispositions of men. It is therefore maintained, that moisture, heat, and cold, depend on the motion, position, situation, and aspect of the superior celestial bodies, and must be accompanied with some peculiar virtue or power, which variously impresses, moves, and agitates the spirits, or subtiler parts within its reach, and must consequently have an influence upon the bodies which they actuate, and wherein such spirits reside. Hence this science ascribes certain powers and influence to these bodies, according to their several positions in their orbits. This imaginary science, therefore, contains the rules requisite to prepare nativities, for working directions, and for all other purposes in astrology. Absurd as it may now appear, it was in great repute in the dark ages of superstition, and even so late as the sixteenth century, previously to which period numerous essays were composed upon this subject. In times of ignorance, when the arts and sciences were little cultivated or understood, all philosophers and learned men came under the general denomination of astrologers; but as soon as mankind had improved in civilization, this art, of necessity, began to decline, and it is now almost entirely unknown. In so great repute was it in the time of Charles the First, that William Lilly, an eminent English astrologer, was frequently applied to and examined respecting future events and secrets unknown to others; so that no material step was taken even by the court without first consulting him. Thus, when that king was at Hampton-Court, in 1647, Lilly was requested to inform his Majesty whither he might retire for safety; and, in the following year, he was consulted for the same purpose whilst his Majesty was at Carisbrooke castle, in the isle of Wight; and, during the siege of Colchester, he and John Booker were sent for to encourage the soldiers, which they did by assuring them that the town would soon be taken, as indeed it was: And such was his reputation in this art, that the king of Sweden presented him with a gold chain, and a medal worth about L.50, on account of his having mentioned his Majesty with respect in his Almanack of 1657. Lilly was likewise examined by Parliament, in 1660, concerning the person who cut off the head of King Charles the First, and again, by a committee of the House of Commons, in October 1666, concerning the fire of London. His astrological works are numerous; but his last publication on this subject was his "Guide for Astrologers," and his chief work is the "Christian Astrology." See also the numerous works of James Ozanam, an eminent French mathematician and astrologer; also Ramsay's *Astrologia Munda*, and the article ASTROLOGY in this Encyclopedia.

Under this science may be included Palmistry, or, as some call it, Chiromancy, the first term being from the Latin and the second from the Greek, the art of divination from the lines on the hand, which, according to Dr Blackwell, was much cultivated by the poet Homer, who, as that author has asserted, wrote a complete treatise upon it. Palmistry was in high repute with the priests and augurs among the Greeks, who borrowed all their knowledge from the Egyptians. The reader, who is anxious to investigate the theory of this art, may consult the Almanack of Pertridge the astrologer, the works of Dr Rothman translated from the Latin by George Wharton, together with the publications of Dr Saunders upon Chiromancy and Palmistry, and the MS. of W. Salmon. It is practised in modern times only by a set of impostors called gypsies, who make it a pretext for picking the pockets of the unwary. As a matter of curiosity, it may be worth while to specify its general principles. The *seven* planets or wandering stars, which are supposed to have a great influence over all sublunary bodies, have their material and significant position in the hands of every individual, there being also *seven* lines or parts of the hand; 1st, the table line or line of fortune; 2d, the middle natural line; 3d, the line of life or of the heart; 4th, the line of the liver or stomach; 5th, the sister line of the line of life; 6th, the percussion of the hand; 7th, the wrist. Each of these correspond respectively to the planets Saturn, Jupiter, Mars, the Sun, Venus, Mercury, and the Moon.

By anatomists the hand is divided into three parts, the wrist, the body of the hand, and the fingers. But, in palmistry, the first of these is termed the palm or plain of Mars: the second is termed the hollow of the hand which extends from the extremity of the other side of the thumb towards the little finger: the third is the five fingers, noted by their names,—Pollex, or thumb, dedicated to Venus; Index, or forefinger, dedicated to Jupiter; Medius, or middle finger, dedicated to Saturn; Annularis, or ring-finger, dedicated to the Sun; Auricularis, the little finger, dedicated to Mercury.

The four principal fingers have twelve joints, attributed to the twelve signs of the Zodiac, and each of these fingers have certain protuberances at their basis, in palmistry termed mounts, each of which denotes something of special import. That of Venus signifies *love*, that of Jupiter *honours*, that of Saturn *misfortunes*, that of Mercury *arts and sciences*, that of the sun *riches*, that of Mars *military achievements*, and that of the moon *afflictions and diseases of the mind*: and from the minute observation of these the artist is supposed to be capable of judging of the various turns of fate, and of determining the future fortune of the individual whose hand he inspects.

2. *Magic, Natural*, or, as it may be denominated, Natural Philosophy, is a useful science, teaching the relation of certain causes and effects among natural objects, by means of which many seemingly wonderful but very intelligible phenomena are produced. As this science was corrupted by the Arabians, who filled it with many superstitious absurdities, the term afterwards came to be used in a bad sense, so that the person who devoted himself to its study was termed a wizard, sorcerer, or conjurer. Indeed many of the most beautiful experiments in natural philosophy have a kind of magical appearance, especially those of electricity, magnetism, and optics, and might easily be looked upon as miracles, by the credulous and illiterate; so that we cannot wonder at the peculiar estimation in which those who exhibited them were held by the generality of the people in times of ignorance.

Under Natural Magic may be comprehended *Legerdemain*,—those curious deceptions and tricks which are performed by sleight of hand.

As a specimen, take one that was performed by Pinetti. It consists in making a ring shift from one hand to another and go on whatever finger is required, while some person holds both arms in order to prevent any communication between them.

Have a gold ring of your own fastened by a small cat-gut string to a watch-barrel sewed to the left sleeve of your coat; then desire some person to lend you a gold ring, recommending him at the same time to put a mark on it, that he may know it again. Take in your right-hand the ring given you; then taking with dexterity, near the entrance of your sleeve, the other ring fastened to the watch-barrel, draw it secretly to the finger-ends of your left-hand, and, during this operation, conceal, between the fingers of your right-hand, the ring that has been lent you, and hang it dexterously on a little hook sewed on the bottom of your waist-coat and hid by your coat. After this, shew your ring which you hold in your left hand; then ask the company on which finger of the other hand they wish it to pass. As soon as the answer has been given, put the before-mentioned finger on the little hook, in order to slip on it the ring, and at the same moment let go the other ring by opening your fingers; the spring in in the watch-barrel, not being any longer confined, will then contract, and draw the ring under the sleeve without being perceived by any one, not even by those who hold your arms. As their attention will be given to prevent your hands from communicating, they will allow you to make the necessary motions, which must be very quick, and always accompanied by stamping with your foot. After this operation, shew the company that the ring is come on the other hand, aad make them mark well that it is the same ring that has been lent you, and that the mark is right. To succeed in this deception, much quickness and dexterity are required.

The following is another deception also practised by the famous Pinetti. It is to cause one penknife out of three to jump out of a goblet, agreeably to the option of the company. This operation consists in the management of a small spring, about an inch broad by two inches and a quarter long, fixed in the bottom of a silver goblet or bowl. Before you begin the operation, you are to take care to bend this spring with a little piece of sugar, which, being compressed between the two ends of the spring, will prevent it from unbending; then exhibiting your three penknives of different colours, ask the company which of them they choose to see spring out of the goblet. In afterwards putting these into the goblet, take care to lay the end of the handle of the one selected in a little round hole that is in the upper end of the spring confined by the bit of sugar; and before you withdraw your hand from the goblet, which must contain in the bottom some drops of water, take a little of it with the tip of your finger, and put it dexterously on the sugar, which by melting will leave the spring at liberty to extend, and make the penknife leap out. While the sugar is melting, you may stand far from the goblet, and command the penknife to spring out, and this will be done, to the great astonishment of all the spectators; yet nothing is more simple than the means of performing this experiment, without the least assistance from any confederate.

In Dean's Legerdemain, there is to be found a simple but surprising deception. A Palatine girl used to make a comfortable livelihood, and even supported her parents, by going from one public-house to another practising it. She tied a ring or a sixpence to the end of a piece of thread, which was suspended from a pin placed for that purpose, and let any one set fire to the thread, which, to all appearance, was burnt to ashes, and yet the ring remained hanging to the end of it. The knowledge of the manner of doing this, was eagerly sought after by all the great masters in the legerdemain art, but without success; for the moment they tried the experiment, and the thread was burnt, the ring fell to the ground. Many offered to purchase the secret from the girl, but she remained inflexible, as she rightly considered that a trifling sum for instant use wonld deprive her of her future livelihood. But fate at last overpowered her. She was taken ill, and, being destitute of even the common necessaries of life, was prevailed upon to communicate the whole of her art to the celebrated Mr Jonas, who generously rewarded her with half a guinea! This trick, which is really surprising, is done by the most simple means imaginable; and all the art lies in preparing the thread, which is done thus: She used to soak the thread in salt and water for some time, and then dry it before the fire; the saline particles adhering to the thread, though imperceptible, immediately caught the flame of the candle, and burnt like so much tow; yet, although it seemed to burn, it really preserved the body of the thread, which remained firm, and seemingly undiminished, though when touched it became pulverised, and crumbled to ashes. Thus, from the most simple things, the most astonishing performances are exhibited.

Another curious deception was performed by Breslaw, under the denomination of the learned little swan. A large marble or China bowl is painted, within side the rim, with the letters contained in the alphabet, and a small artificial swan is set to swim in the centre of the water contained in it. The performer bids any one call for a letter; upon naming the letter, the swan quits its station in the middle, and goes directly to the letter mentioned, or, if it is desired, will pick out the whole of what composes your name. This, no doubt, is looked upon with astonishment! But the amazement it occasions will vanish when it is known, that a small steel or iron pin is fixed withinside the swan, and that the performer has a magnet in his pocket, by which means, as he moves round the table, it attracts the swan to every letter where it is wanted to stop at, till it forms the name of whatever is required. The nature of the magnet being known, many curious experiments have been made with it. A knife, or any other piece of iron, touched with the loadstone, will bring up nails or needles out of a pail of water, or, by rubbing round the outside on the bottom of a pewter plate, will cause needles, or any thing made of iron or steel, to dance and move about just as you direct it on the outside. Breslaw was not a little disconcerted one evening in the Hay-market. The late Sir Francis Blake Delaval going to see his exhibition, took a magnet in his pocket, and facing the performer on the opposite part of the table, the swan, being between the two attractive instruments, became fixed in the middle. The artist, perceiving he could not perform as usual, exclaimed there was somebody in the room in the secret, who counteracted his intention. Sir Francis smiled, shewed his magnet, and the trick became no longer wonderful.

In his Letters to his Son, Lord Chesterfield observes, that " Mankind are easier deceived than undeceived;" and, if it were not so, half the jugglers would want employment, and the multitude would not crowd so often to see their wonders.

A very few more examples will be sufficient to gratify the curiosity of the reader upon the subject of magical transmutations; and the following will be found in that excellent collection of amusing experiments lately published, " Endless Amusement." Infuse a few shavings of logwood in common water, and when the liquor is sufficiently red pour it into a bottle; then take three drinking glasses, and rince one of them with strong vinegar; throw into the second a small quantity of pounded alum, which will not be observed if the glass has been recently washed; and leave the third without any preparation. If the red liquor in the bottle be poured into the first glass, it will appear of a straw colour; if into the second it will pass gradually from bluish-gray to black, when stirred with a key or any piece of iron which has been previously dipped in strong vinegar. In the third glass, the red liquor will assume a violet tint.

On this head a few experiments will be sufficient. 1. Chemical illuminations. Put into a moderate sized bottle, with a short wide neck, three ounces of oil or spirit of vitriol, with twelve ounces of common water, and throw into it, at different times, an ounce or two of iron filings. A violent commotion will then take place, and white vapours will arise from the mixture. If a taper be held to the mouth of the bottle, these vapours will inflame, and produce an explosion, which may be repeated as long as the vapours continue.—2. To give a ghastly appearance to persons in a room. Dissolve salt in an effusion of saffron and spirits of wine; dip some tow in this solution, and having set fire to it, extinguish all the other lights in the room. At this light, those who are of a fair complexion will appear green, and the red of the lips and cheeks turn to a deep olive colour.—3. To change blue to white. Dissolve copper filings in a phial of volatile alkali: when the phial is unstopped, the liquor will be blue, when stopped it will be white.—Numerous other specimens of philosophical experiments and deceptions performed by means of cards and dice, as well as those wonderful exhibitions practised by the Indian jugglers and other persons of this description, might likewise be noticed here. But to say more on these subjects seems to be altogether unnecessary, as it would be calculated only to tire the reader's patience; and as those who wish to pursue their inquiries farther will be amply gratified by consulting the Conjuror's Magazine, or Magical and Philosophical Mirror, published in London 1791, also Endless Amusements, or a Collection of nearly 400 entertaining Experiments in various branches of Science, lately published in London.

It is presumed that the specimens already given will be sufficient to convince the reader that all performances of this kind are carried on merely by sleight and deception, and that the exhibitors are no more conjurors than other individuals, but only through art and practice; so that any one might soon be capable of the same, did he bestow his time and attention on things of such a nature. By performances of this kind, it is obvious that we may be enabled to account for many of those wonders which, in ignorant and superstitious ages, have been ascribed to sorcery, witchcraft, and the power of evil spirits, as well as for those miracles that have been alleged to have been performed at the tombs of supposed saints and prophets in the darker ages.

3. *Magic, Goetic or Superstitious,* is what has been termed the black art, which consists in the invocation of devils, and in dealing with familiar spirits, or in conjuring, sorcery, and witchcraft. The effects of this art are supposed to be produced in virtue of some compact with the devil, or other evil spirit; and the objects proposed to be accomplished by it are generally of a malignant or diabolical nature. This species of magic is supposed to have had its origin in Egypt, as the magicians of Pharaoh are the first that are mentioned in any history. The Egyptians, having been known as a wise and learned people, were supposed to have made great progress in this science; and it appears that they not only believed in the existence of demons, but also that different orders of these evil spirits had power over the

persons and affairs of mankind, as well as over the elements of nature. Every disease that afflicted the human body was consequently ascribed to the agency of some evil spirit or demon which they believed had taken possession of the human body, and could not be removed unless by certain charms and incantations. By them it was universally supposed that those persons who were masters of this art could not only cure all diseases, but also inflict them, by means of evil spirits that were subject to their control.

From among the magicians of the dark ages, there at length arose what has been termed the Rosycrucian philosophy. The Rosycrucians, or brothers of the Rosycross, were a particular sect of hermetic philosophers who first appeared in Germany in the beginning of the 14th century. They pretended to a knowledge of all sciences, and among other things alleged that they had discovered the philosopher's stone, all which they affirmed they had received by tradition from the ancient Egyptians, Chaldeans, Magi, and Gymnosophists. The chief of this sect was a German named Christian Rosencruz, who having gone to the Holy Land fell sick at Damascus, and consulted the Arabs and other eastern philosophers, by whom it is supposed he was instructed in this wonderful art. The appellation of this class of philosophers, has by some, been derived from the two words *rosa* and *crux*, which signify rose and cross; and by others, from the Latin word *ros*, which signifies dew. Those who are inimical to free-masonry consider the society of free-masons to be the Rosycrucians themselves under a new name.

MAGIC LANTERN, OR LANTHERN, an optical instrument, originally invented by Kircher, and constructed upon the same principles as the solar microscope. It is often used for the purpose of magnifying small transparent objects, and is likewise admirably calculated for amusement, by representing the images painted on glass upon a white cloth or screen, or upon the opposite wall of a dark room, at a proper distance from the machine.

The construction of this amusing instrument is so well known that it would be superfluous to describe it; but it may be of use to make the reader acquainted with the mode of drawing the figures, and with some of the most diverting experiments it is capable of exhibiting, and which, with many others, will be found described in the works already mentioned.

To prepare the glasses, first draw on paper the size of the glass the subject you mean to paint; fasten this at each end of the glass with paste, or any other cement, to prevent it from slipping. Then with some very black paint, mixed with varnish, draw with a fine camel's hair pencil, very lightly, the outlines sketched on the paper, which, of course, are reflected through the glass. Some persons affirm that these outlines can be more readily traced with japan writing ink, and a common pen, with a fine nib; but this, even if it succeeds in making a delicate black line, is sure to be effaced by damp or wet. The outlines ought to be drawn with a strong tint of each of the natural colours of the object, and, when dry, the figures should be coloured and shaded, and afterwards tempered with strong white varnish. The best colours for this purpose are transparent ones; opaque, or mineral colours, will not do. These are in most repute: for pink and crimson, lake or carmine may be made use of; for blue, Prussian blue; for green, calcined or distilled verdigris; and for yellow, gumboge.

The following experiment will represent a storm at sea. Provide two strips of glass, whose frames are thin enough to admit both strips freely into the groove of the lantern. On one of these glasses paint the appearance of sea, from a smooth calm to a violent storm; see Plate 112. Fig. 7. and 8.; let these representations run gradually into each other: and you will of course observe that the more natural and picturesque the painting is, the more natural and pleasing will be the reflection. On the other glass paint various vessels on the ocean, observing to let that end where the storm is, appear in a state of violent commotion, and the vessels, as if raised on the waves in an unsettled position, with heavy clouds about them. Then pass the glasses slowly through the groove, and when you come to that part where the storm is supposed to begin, move them gently up and down, which will give the appearance of the sea and vessels being agitated; increase the motion till they come to the height of the storm. You will thus have a very natural representation of the sea and ships in a calm and a storm; and as you gradually draw the glasses back, the tempest will subside, the sky appear clear, and the vessels glide gently over the waves.

In the same manner you may also represent a battle on land, a naval engagement, &c. See Fig. 5. and 6.

By this instrument, also, may be produced the appearance of a spectre, on a pedestal, in the middle of a table. Let a magic lantern be enclosed in a box of a sufficient size for a small swing dressing-glass to reflect the light cast upon it, so as to pass out in the opening at the top of the box. To cover this opening, which ought to be of an oval form, there should be sides, or a flap with hinges, to conceal the inside of the box. To let the smoke out, there must be holes in the top of the box. Over this an oblong chaffing-dish must be placed for containing a few lighted coals. To conceal this chaffing-dish, it may be enclosed in a painted tin box, with a hole at top for the smoke; and there must also be a glass so fixed that it may be raised up and let down in the groove by means of a cord and pulley. On this glass the figure or spectre ought to be painted in a contracted form, as it will reflect a greater length than the painting. After lighting the lamp and placing the mirror in a proper situation in the lantern, place the box on a table with the chaffing-dish within, and throw upon the coals some incense, in powder. Having opened the trap-door and let the glass slowly down in the groove, *a b*, as soon as you see the smoke diminish draw the glass up and shut the trap-door, that the figure may disappear. To give proper effect to this exhibition the lights in the room must be extinguished, and the box raised on a high table, so that the opening through which the light issues out may not be seen. Besides this, many other curious and pleasing experiments may be performed.

with this instrument, which, though extremely interesting, it would be superfluous to specify in a work of this kind, as enough has been said to explain the nature of the invention.

MAGIC SQUARE consists of a series of numbers in mathematical proportion, so arranged in parallel and equal columns as that the amount of each row, calculated horizontally, perpendicularly, or diagonally, are precisely the same. Suppose the various figures of which any square number is composed, from 1 to 36, the square number inclusive, be arranged in their natural order in 36 cells of a square figure: suppose the order of these figures to be changed in such a way as that the six numbers which occupy the horizontal rank of cells shall, when added together, be the same as the six numbers in any other rank or column, whether vertical, horizontal, or diagonal: this arrangement of the numbers is denominated a magic square, to distinguish it from what is termed a natural square. For an illustration of this, the following will suffice:

Natural Square.

1	2	3
4	5	6
7	8	9

Magic Square.

6	1	8
7	5	3
2	9	4

In times of ignorance and superstition, when mathematics were, by the common people, considered as magic, it is not by any means surprising, that the singular result of all these columns, taken every way, and amounting always to the same sum, should appear in the light of magic; and the more especially as they were employed in the construction of those magical figures made under certain constellations, and which were termed *talismans*, for, according to the philosophy of those times, certain virtues were ascribed to numbers.

Unless the magical square can be supposed capable of producing some new views of numbers, it must be considered rather as calculated for amusement than for any practical use. The first rules that we meet with for the construction of magic squares, were invented by a Grecian mathematician, Eman Moschopulus. Agrippa, in his system, gives us the squares of seven numbers magically disposed, from 3 to 9 inclusive, which are termed planetary; for example,—the square of 3 is appropriated to Saturn, 4 to Jupiter, 5 to Mars, 6 to the Sun, 7 to Venus, 8 to Mercury, and 9 to the Moon. After him M. Bachet, and subsequently M. Frenicle, made several improvements in the method of constructing those squares, and a treatise imputed to the latter on this subject was published after his death in 1693. About ten years after this period, M. Poignard made several very important improvements, and, by his publication, M. de la Hire was induced to direct his attention to this subject, and may be said to have nearly completed the theory of magic squares. This study was in great repute among the Indians of Surat, as M. de la Loubere informs us; and there are several methods proposed by him for the construction of these squares. Let an odd square be supposed, the root of which is 7, and which is to be filled up with the 49 first of the natural numbers. Let unity then be placed in the middle cell of the horizontal band, at the top; proceed then from left to right, and ascend diagonally; and as 2 would go beyond the square in that direction, transport this number to the lowest cell of that vertical band to which it belongs; then place 3 and 4 in the cells as you ascend from left to right diagonally; but as 5 would reach beyond the square in that direction, let it be transported to the most distant cell of the horizontal band it belongs to; then place 6 and 7 in the next cells, always ascending diagonally from left to right; but, as the cell which would come to be occupied by 8 is already filled by 1, let 8 be placed immediately below 7, placing 9, 10, in the next cells, ascending diagonally; and, according to the first rule of transposition, let 11 be placed at the bottom of the 6th vertical band, then 12 in the next cell, ascending diagonally; then 13, according to the second rule of transposition, in the most distant cell on the left of the 5th horizontal band; then 14 in the next cell, ascending diagonally; then 15 under it, according to the third rule of transposition, ascending always diagonally towards the right, with the numbers 16, 17, 18, 19; and there being no higher cell, let the next number be placed at the bottom of the last vertical band, by the first rule of transposition; and let 21 be placed in the bottom cell but one of the first vertical band, according to the second rule of transposition; and, under it, 22, by the third rule; after which let the diagonal be filled up with the numbers 23, 24, 25, 26, 27, 28; and there being no higher cell, place 29 under 28. And in the same manner it will be easy to fill up the remaining cells, as under.

30	39	48	1	10	19	28
38	47	7	9	18	27	29
46	6	8	17	26	35	37
5	14	16	25	34	36	45
13	15	24	33	42	44	4
21	23	32	41	43	3	12
22	31	40	49	2	11	20

By the same rules, the following squares of 5, and 9, are completed. Should the reader be inclined to enter more deeply into this subject, he is referred to the ingenious works of the authors already mentioned, together with that of the late ingenious Dr Franklin, who has not only constructed a magic square of squares, but also a magic circle of circles.

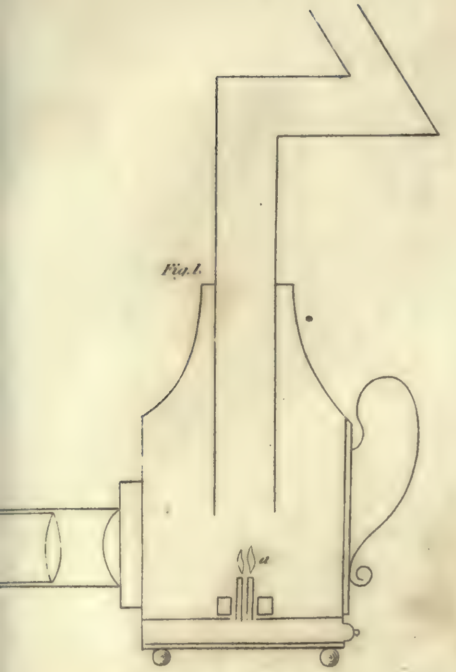
Fig. 1.

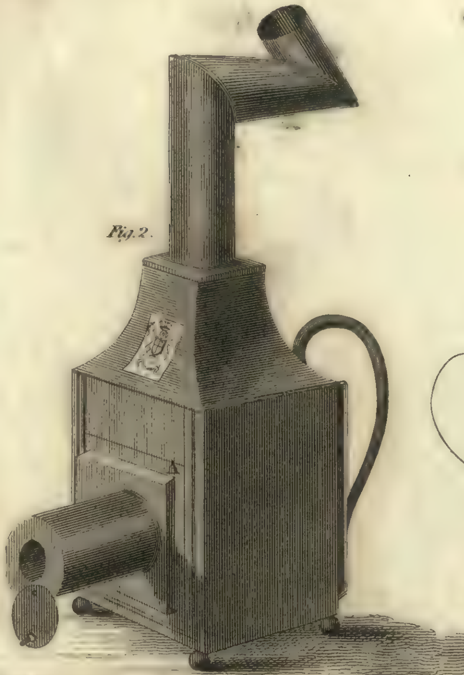
Fig. 2.

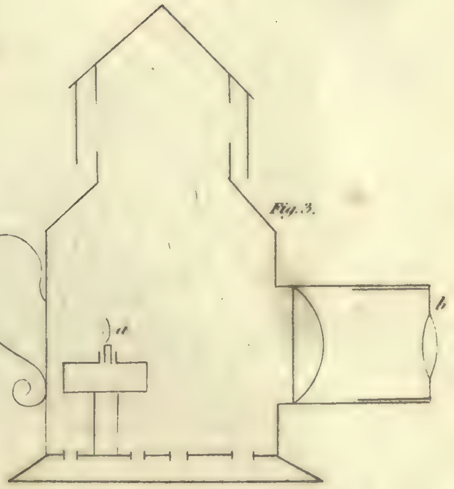
Fig. 3.

Fig. 7.

Fig. 8.

Fig. 4.

Fig. 5.

Fig. 6.

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17	24	1	8	15
23	5	7	14	16
4	6	13	20	22
10	12	19	21	3
11	18	25	2	9

47	58	69	80	1	12	23	34	45
57	68	79	9	11	22	33	44	46
67	78	8	10	21	32	43	54	56
77	7	18	20	31	42	53	55	66
6	17	19	30	41	52	63	65	76
16	27	29	40	51	62	64	75	5
26	28	39	50	61	72	74	4	15
36	38	49	60	71	73	3	14	25
37	48	59	70	81	2	13	24	35

MAGINDANAO, the most southerly of the Philippine islands, lies between 119° and 125° east longitude, and between 6° and 10° north latitude, and is about 300 miles in length and 100 miles in breadth. It is well wooded, and diversified with lofty mountains, extensive lakes, and spacious plains, which are crowded with cattle. A volcanic mountain in the south-east quarter emits sulphureous flames, and is supposed by the natives to be the residence of a divinity. The soil is fertile, and produces rice, yams, cocoa-nuts, plantains, oranges, limes, &c. The island consists of three divisions, the first of which is the residence of the sultan; the second portion is possessed by the Spaniards, and extends along the coast to the west, north, and north-east; and the inland, or third division, is inhabited by savage tribes. The town of Yligan, with 150 houses, and that of Cayagan, with 400 houses, are Spanish settlements. The principal town is Magindanao, seated near the river of the same name, and united by a bridge with the opposite town of Selangan, which is chiefly occupied by Chinese settlers. Here are several castles, constructed of wood, besides the palace, which is well fortified. The authority of the sultan is unrestrained, and he is guarded with captives and slaves. Next to him in the government is the rajah of Boyant, who is said to have 20,000 Mahommedan subjects. The natives are temperate and cleanly, and in many of their customs resemble the Chinese. Their houses are built at considerable distances, and, being elevated on posts, are ascended by ladders. The Horaforas migrate from place to place, to avoid the oppressions of the Mahommedans. They are extremely particular in tying their hair round a circular board, about six inches in diameter, and on the crown of the head; their ears are stretched surprisingly, by large rings and beads, and they wear rings of brass upon their legs and arms. Their weapons of defence are bows and arrows, swords, lances, and targets. The Bangel tribe, in the interior, are totally uncivilized. The natives of this island have acquired a knowledge of some arts, so as to be able to manufacture cloth, ear-rings, and buttons; and they build tolerable vessels for their predatory expeditions to the Philippine and other islands. The trade of Magindanao is considerable, and the currency consists chiefly of pieces of coarse cloth, and of pieces of copper strung on a cord. The exports are gold, tobacco, pepper, rice, wax, and cassia; in return for which, cloths of different kinds, Surat goods, and European cutlery are imported. The language of the natives is a mixture of Malay, Buggess, and Zagala, with a portion of the Molucca tongue.

This island was visited by Magellan in 1521; the Dutch, in 1698, were desirous of effecting a settlement on it; and the Spaniards have, with difficulty, kept possession of the northern coast. Britain has had little intercourse with it. See *Asiatic Researches*, and Forrest's *Voyage to New Guinea*.

MAGISTRATE, an officer who is entrusted with the executive power of the law.

MAGNA CHARTA, the great charter of the liberties, and basis of the laws of Britain, was signed by King John at Runnymead, June 19, 1215, and confirmed by Henry III. and Edward I. See BRITAIN.

MAGNESIA, a peculiar sort of earth. See CHEMISTRY and MATERIA MEDICA.

MAGNET, or LOADSTONE. See GEOLOGY and MAGNETISM.

MAGNETISM.

History.

Magnetism, derived from μαγνης, a certain species of ferruginous ore, is the science which treats of the properties of magnets, whether natural or artificial, their reciprocal action, and the various circumstances by which their power is increased or diminished.

Some writers have traced the history of this term to Magnes, a shepherd, who is said to have first discovered the attractive quality of the substance in question, by the effect which it produced on the iron of his crook when passing over some part of mount Ida. Others assert, that as the peculiar property of the magnetic ore was first detected in Heraclea, a city of Magnesia, it acquired from this topographical accident the name by which it is usually known, as well as that of *Lapis Heracleus*, an appellation which is not less frequently applied to it by the ancient philosophers.

In regard to the magnetic properties, in general, it may be observed, that they can by proper methods be communicated to other ferruginous bodies, which will afterwards act exactly like natural magnets, and hence are denominated *artificial magnets.* A magnet, whether natural or artificial, is always possessed of the following characteristic qualities, which are inseparable from its nature: so that, says Cavallo, a body cannot be called a magnet unless it be possessed of all those qualities at the same time.

1. A magnet attracts iron and other ferruginous substances, and seems not to have any decided agency upon any other bodies: on which account, it is inferred, that the magnets, whether natural or artificial, and the substances upon which they act, are either iron in its pure state, or such bodies as contain iron.

2. When a magnet is so placed as to be at liberty to move itself with sufficient freedom, it will be found to turn constantly the same part of its surface towards the north pole of the earth, or towards a point not much distant from it; and of course it turns the opposite part of its surface towards the south pole of the earth, or towards a point not greatly removed from that pole. Those parts, in the surface of the magnet, are therefore called its *poles;* the former being denoted its *north pole,* and the latter its *south pole.* The property itself is called the *magnetic directive power,* or the *magnetic polarity:* and when a magnetic body places itself in the direction above stated, it is said *to traverse.* A plane perpendicular to the horizon, and passing through the poles of a magnet when standing in their natural direction, is called the *magnetic meridian;* and the angle which the magnetic meridian makes with the meridian of the place where the magnet stands, is called the *declination of the magnet.*

3. When two magnets are placed, so that the north pole of one of them is opposite to the south pole of the other, they will be observed to attract each other; but if the south pole of the one magnet be placed opposite to the south pole of the other, or if the north pole of the one be brought near to the north pole of the other; in either case they will be found to repel each other. In a word, magnetic poles of the same name manifest mutual repulsion, while those of different names reciprocally exercise the attractive energy.

Attraction and Repulsion.

4. When a magnet is situated so as to be at liberty to move itself with sufficient freedom, it generally inclines one of its poles towards the horizon, and of course it elevates the other pole above it. This is called the *inclination* or *dipping of the magnet,* or of *the magnetic needle.*

Having premised these general laws, we shall now proceed to state a few facts in regard to the several circumstances which appear to affect the processes of MAGNETIC ATTRACTION AND REPULSION.

The force of this attraction is known to vary with the conditions in which it is found to act. A magnet, for example, attracts a piece of soft and clean iron more forcibly than any other ferruginous body of the like shape and weight, especially such as are of a harder nature. Thus, hard steel or hard iron ores are attracted less forcibly than soft steel, and the latter less forcibly than iron. Oxygenated iron is attracted less forcibly in proportion as it is combined with more oxygen.

If a piece of iron be presented successively to the various parts of the surface of a magnet, it will be found that the attraction is strongest at the poles of the magnet; that it diminishes in proportion as the part of the surface is more distant from the poles; and that it is hardly perceivable at those parts which are equidistant from the poles of the magnet.

The attraction is strongest near the surface of the magnet, and diminishes as the distance increases; viz. if a piece of iron be placed in contact with one of the poles of a magnet sufficiently strong, they will adhere to each other, and a certain degree of force is required to separate them; but if the same piece of iron be kept at a certain distance from the same pole of the magnet, there will also be perceived an endeavour to attract it; but the force necessary to prevent that attraction, will be found much less than that which, in the preceding case, was found necessary to separate them; and by increasing the distance, the attractive force will be found to diminish. Now it is very remarkable, that the law of this diminution of the attractive force has not yet been ascertained, notwithstanding a vast number of experiments which have been made expressly for the purpose. Some philosophers have found it to decrease in proportion to the squares of the distances, others in proportion to the cubes of the distances, and others again have found it to decrease according to one ratio within a certain distance, and according to another ratio beyond that distance. This difference of results arises from the various powers and shapes both of the magnets and of the iron; for as the attraction of the whole arises from the attraction of the parts, it naturally follows that if you gradually remove a piece of iron from the magnet, the distances between the

Attraction and Repulsion.

Attraction and Repulsion.

nearest parts may increase in one ratio, whilst the distances between other parts will increase in another ratio, and by changing the magnets, or the shapes of the iron, those ratios must necessarily be changed. The only thing we can say respecting this decrease is, that the attractive force decreases faster than the simple ratio of the distances.

There is a limit in the shape and weight of the iron which may be most forcibly attracted by a given magnet, viz. more forcibly than a smaller or larger, a more or less, extended piece of iron ; but this limit can only be determined by actual experiments. A single piece of iron is attracted more forcibly than if it be divided into several parts, and all those parts be presented to the same magnet.

The attraction between the different poles of two magnets has been found to begin from a greater distance, but to be less powerful when in contact, than between soft iron and a magnet.

Magnetic repulsion takes place only between similar poles of different magnets. Thus, if the north pole of one magnet be opposed to the north pole of another magnet, or if the south pole be opposed to the south pole, then those magnets will repel each other, and that nearly with as much force as the poles of different names would attract each other. But it frequently happens, that though magnets are placed with their like poles towards each other, yet they either attract each other, or shew a perfect indifference. These phenomena seem to contradict the above-mentioned general law ; but the following facts will remove the difficulty :

When a piece of iron, or of any other substance that contains iron, is brought within a certain distance of a magnet, it becomes itself a magnet, having the poles, the attractive and repulsive properties, &c. like another magnet. That part of it which is nearest to the magnet acquires a contrary polarity, and the opposite part the same polarity.

The magnetism which is acquired by being placed within the influence of a magnet, in soft iron, lasts only whilst the iron continues in that situation, and when removed from the vicinity of the magnet its magnetism vanishes immediately. But the case is quite different with hard iron, and especially with hard steel ; for the harder the iron or the steel is, the more permanent is the magnetism which it acquires from the influence of a magnet ; but it will be in the same proportion more difficult to render it magnetic. If, for instance, a soft piece of iron and a piece of hard steel, both of the same shape and size, be brought within the influence of a magnet, at the same distance, it will be found that the iron is attracted more forcibly, and appears more powerfully magnetic than the steel ; but if the magnet be removed, the soft iron will instantly lose its magnetism, whereas the hard steel will preserve it for a long time, having thereby become an artificial magnet.

From those facts three consequences are evidently deduced, viz. 1st, That there is no magnetic attraction but between the contrary poles of magnets ; for the iron, or other ferruginous body which is presented to the magnet, must itself become a magnet before it is attracted ; 2dly, It appears why a magnet attracts a piece of soft iron more forcibly than hard iron, and much more than hard steel, viz. because the latter does not become so strongly or so easily magnetic as the soft iron, when presented to a magnet ; and, 3dly, that no magnetic repulsion can take place but between poles of the same name ; for when the north pole, for instance, of one magnet, does not seem to attract or repel, or it actually attracts what was called the north pole of the other magnet, the fact is, either that the two north or the two south poles have destroyed each other, or that the superior force of one of the magnets has actually changed the poles of the weaker magnet ; as is, beyond a doubt, proved by experiments.

Neither the magnetic attraction nor the magnetic repulsion is in the least diminished or otherwise affected by the interposition of any sort of bodies, except iron, or such bodies as contain iron.

The properties of the magnet are not affected either by the presence or by the absence of air.

Heat weakens the power of a magnet, and the subsequent refrigeration restores it, but not quite to its pristine degree. A white heat destroys it entirely, or very nearly so ; hence it appears, that the powers of magnets must be varying continually. Iron in a full red heat or white heat, (as is found by means of very decisive experiments,) is not attracted by the magnet ; but the attraction begins to act as soon as the redness begins to disappear.

The attractive power of a magnet may be increased considerably by gradually adding more and more weight to it ; keeping it at the same time in a proper situation, viz. with its north pole towards the north, &c. And, on the contrary, that power may be diminished by an improper situation, and by keeping too small a piece of iron, or no iron at all, appended to it.

It seems that, in these northern parts of the world, the north pole of a magnet has more power than its south pole, whereas the contrary effect has been said to take place in the southern parts of the world.

Amongst the natural magnets, the smallest generally possess a greater attractive power in proportion to their size than those of a larger size. I have seen, says Mr Cavallo, a small magnet that weighed about six or seven grains, and which could lift a weight of about 300 grains. Magnets of above two pounds weight seldom lift up ten times their own weight of iron.

It frequently happens, that a natural magnet, cut off from a larger load-stone, will be able to lift a greater weight of iron than the original load-stone itself. This must be attributed to the heterogeneous nature of the original load-stone, of which the part cut off may be the purest.

As both magnetic poles together attract a much greater weight than a single pole, and as the two poles of a magnet generally are in opposite parts of its surface, in which case it is almost impossible to adapt the same piece of iron to them both at the same time ; therefore it has been commonly practised to adapt two broad pieces of soft iron to the poles of the stone, and to let them project on one side of the stone ; for those pieces become themselves magnetic while thus situated, and to them the piece of iron or weight may be easily adapted. Those two pieces of iron are generally fastened upon the stone by means of a brass or silver box. The magnet in this case is said to be *armed*, and the two pieces of iron are called the *armature*.

Artificial magnets, when straight, are sometimes armed in the same manner; but they are frequently made in the shape of a horse-shoe, having their poles at the truncated extremities, in which shape it is evident that they want no armature.

It has been said above, that the magnet attracts iron only, or such bodies as contain iron; and as iron is universally dispersed throughout mineral substances, it is evident that a vast number of bodies must, on that account, be attracted by the magnet more or less forcibly, in proportion to the quantity and quality of the iron they contain. Indeed, it is wonderful to observe what a small admixture of iron will render a body sensibly attractible by the magnet. Yet it must be acknowledged, that though every substance which contains iron is in some measure attracted by the magnet, it does not follow that no other can be attracted by it. Experience shews that a vast number of substances are in a very slight degree attractible by the magnet, and those substances seem to contain either no iron at all, or an exceedingly small quantity of it, extremely diffused and oxidated. To manifest this small degree of attraction, the substances must be placed upon a piece of paper or a light shaving of cork, to float upon water, and a strong magnet must be gently approached, sideways, within sometimes a tenth of an inch distance from the substance under trial. In this manner it will be found that the following substances are in some measure affected by the magnet, viz. most metallic ores, especially after their having been exposed to a fire. Zinc, bismuth, and particularly cobalt, as well as their ores, are almost always attracted. Of the earths, the calcareous is the least, if at all, and the siliceous is the most frequently attracted. The ruby, the chrysolite, and the tourmalin are attracted. The emerald, and particularly the garnet, are not only attracted, but frequently acquire a permanent polarity. The opal is weakly attracted. Amber and other combustible minerals are attracted, especially after combustion. Most animal and vegetable substances, after combustion, are attracted. Even soot, and the dust which usually falls upon whatever is left exposed to the atmosphere, are sensibly attracted by the magnet.

About fifteen years ago, says Mr Cavallo, I discovered several remarkable facts relative to magnetic attraction; the principal of which are as follows:—

If most specimens of brass, which shows no attraction towards the magnet, be hammered, (viz. be hardened by being beat with a hammer or with a stone, or otherwise,) they will, in that hardened state, be attracted. The same piece of brass will no longer be attracted after being softened in the fire; a second hammering will again render it attractible, and so on repeatedly.

Most of the native grains of platinum have the same property, viz. hammering renders them attractible by the magnet; and heat deprives them, as well as brass, of that property.

The attraction between iron and the magnet is increased by the action of the nitric, and particularly of the sulphuric acid, upon the iron, during the effervescence. For this purpose the iron was placed in a proper vessel near one end of a magnetic needle, (viz. a magnetic bar lightly suspended,) which was a little deflected from its natural direction by the proximity of the iron; but when diluted sulphuric acid was poured upon the iron, and the effervescence took place, the magnetic needle moved a little towards the iron, shewing that the attraction was increased by the action of the acid. The nitric acid produced the like effect, but not so powerfully. When the effervescence was nearly finished, the needle was found to stand farther from the iron than it did before the acid was poured upon the latter; which was certainly owing to its being in an oxygenated state.

The attractive power of the magnet was long known before its more valuable property of pointing to a particular part of the heavens was ascertained. In the progress of discovery it was found out, that every magnetised body has two poles—a north and a south; a fact which was soon rendered of the greatest service to the interests of navigation.

It sometimes happens, though not frequently, that two poles of the same name, and equally powerful, are at the opposite extremities of a magnet, and a pole of the other name lies in the middle; in which case the magnet has no tendency to place itself in the magnetic meridian. But good magnets, of an uniform texture and shape, have two poles only, which lie at opposite parts of their surfaces; so that a line drawn from the one to the other passes through the centre of the magnet.* That line is called the *axis*; and a line formed all around the surface of the magnet, by a plane which divides the axis into two equal parts, and is perpendicular to it, is called *the equator of the magnet*.

When a magnet having two poles is freely suspended, or if it be allowed to float upon water, and no iron be near, it will place itself in the magnetic meridian, viz. with its north pole towards the northern, and of course with its south pole towards the southern parts of the world, and that in every part of the world.

This wonderful property of the magnet forms the most useful part of the subject of magnetism. It is this property that enables the mariners to conduct their vessels through vast oceans, out of the sight of land, in any given direction; this directive property guides the miners in their subterranean excavations, and the traveller through deserts otherwise impassable.

The general method is to keep a magnet, be it artificial or natural, freely suspended, which in that case will place itself very nearly north and south; then the navigator, by looking at the direction of this magnet, may steer his course in any required direction. Thus if a vessel, setting off from a certain place, must go to another place which lies exactly westward of the former, the navigator must direct it so that its course may be always at right angles with the direction of the magnet, keeping the north end of the magnet on the right-hand side, and of course the south end on the left-hand side of the vessel; for, as the magnet or magnetic needle lies north and south, the direction east and west, which is the intended course of the vessel, is exactly perpendicular to it. A little reflection will easily shew how the vessel must be steered in any other direction.

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* Here it must not be understood, that the polarity of a magnet resides only in two points of its surface; for, in truth, it is the half, or a great part of the magnet, that is possessed of one polarity, (viz. has the property of repelling the like pole of another magnet,) and the rest of the magnet is possessed of the other polarity; the poles then are those points in which that power is the strongest.

An artificial steel magnet, fitted for this purpose in a proper box, is called the *magnetic needle*, or the *mariner's compass*, or *sea compass*, or simply the *compass.*[*]

Though the north pole of the magnet in every part of the world is directed towards the northern parts, and the south pole towards the southern parts, yet that direction seldom is exactly in the direction of the poles of the earth. In other words the magnetic meridian, and the real meridian in any given place, seldom coincide. The angle which they make is called the *angle of declination*, or *the declination of the magnetic needle*; and this declination is said to be *east* or *west*, according as the north pole of the needle is eastward or westward of the astronomical meridian of the place.

This declination is different in different places on land as well as at sea; and is, besides, continually varying in the same place. For instance, the declination in London is not the same as at Paris, or as in India; and the declination in London, or in any other place, at this time, is not the same as it was some years ago. The change, or the *variation* of the declination, may be observed even in one or two hours time; or, more properly speaking, the magnetic meridian in any one part of the world is continually shifting its situation. This is not owing to the various construction of the magnetic needle; for in the same place and time all good magnetic needles are directed the same way.

The declination and the variation of the declination in different parts of the world are so uncertain as not to be foretold; an actual trial is the only method of ascertaining it. This therefore forms a great impediment to the perfection of navigation. It is true that navigators and other observers endeavour to ascertain the declination in various parts of the world, and such declinations are set down upon maps, charts, in books, &c. but, on account of the continual variation, they can only serve for a few years; nor has it as yet been discovered that this variation or fluctuation is subject to any law or period, though various hypotheses have been offered to the public.

It is hardly necessary to mention, that the magnetical properties of metallic substances are greatly modified by the condition in which these substances exist, whether in regard to purity or temperature. In the course of their investigations, Mr Barlow and Mr C. Bonnycastle had arrived at results somewhat different in regard to the magnetic power of ferruginous bodies, as determined by their effect on a magnetical needle; on which account they resolved to institute a series of experiments on all such varieties of iron and steel as could be easily obtained, the principal of which we proceed to abridge.

Experiments on the relative Magnetic Power of different descriptions of Iron and Steel.

"In these experiments, my first trial, (says Mr Barlow,) was made on four different kinds of metal; viz. cast-iron, soft or malleable iron, soft blistered steel, and hard blistered steel. Of each I had two bars formed, 24 inches in length, and 1¼ inch square. The four bars of blistered steel were of the same quality, except that two of them were softened and two hardened for the experiments; which latter were conducted in the following manner:

"The compass was first placed so as to read correctly north and south; a situation was then taken for the bars, so that the lower end of each, successively, was on a level with the pivot of the compass, and distant from it 10·6 inches, first to the east and then to the west, the bar itself being made to incline in the direction of the dip.

"For the purpose of recording the results, the ends of each bar were marked A and B, and the four faces were numbered 1, 2, 3, 4, each of which was successively turned towards the compass; but as little or no difference could thus be detected, I shall simply give the results of each end of the several bars, and the means of each different specimen.

Table of the deviations produced on a magnetised needle, by different descriptions of iron.

Description of Metal.		East Compass.		West Compass.		Mean.
		End A.	End B.	End A.	End A.	
		° ′	° ′	° ′	° ′	° ′
Cast Iron,	No. 1.	7 30	7 37	8	7 45	7 48
Ditto	No. 2.	6 30	9 30	6 0	9 38	
Malleable Iron.	No. 1.	15 30	16 22	15 30	16 22	15 54
	No. 2.	16 0	15 45	16 0	15 45	
Soft blistered steel.	No. 1.	10 56	9 56	10 52	9 56	10 50
	No. 2.	14 22	8 7	14 22	8 7	
Hard blistered steel.	No. 1.	9 56	8 0	10 0	8 0	8 37
	No. 2.	9 30	7 0	9 30	7 0	

"A similar series of experiments was made at the distance of 6.7 inches, which gave angles of deviation very nearly proportional to the above.

"The first thing which calls for particular remark in these experiments is, the near agreement in the mean results of each of the two bars of the same

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[*] It is not precisely known when and by whom this wonderful property of the magnet was discovered. The most probable accounts seem to prove that the directive property of the magnet was known early in the 13th century; and that the person who first made mariners compasses, at least in Europe, was a Neapolitan of the name of Flavio, or John de Gioja, or Giova, or Gira, who likewise lived in the 13th century.

Attraction and Repulsion.

kind, as for example in the two cast-iron bars, which differ from each other only a few minutes, and the same with the two of soft iron. With the steel bars there is rather a greater difference; but even here the agreement is sufficiently close to show that the results we have obtained were not merely accidental, but that they exhibit the permanent difference in the magnetic quality of these different kinds of iron.

"Another remarkable fact is, that although we find in some of the bars a considerable difference in the action of their two extremities, yet the mean of the two still agree with the mean of the other bar of the same kind. This is particularly exemplified in the two cast-iron specimens.

"I could not procure bars of shear steel of the same lateral dimensions as the above, at least not without the operation of forging, which I was apprehensive might injure the texture and alter the character of the metal. In order, therefore, to obtain a comparison with the above results, I took four bars of shear steel from the rollers, and had two of them hardened and two softened for the experiment; I had also two soft iron bars made of the same dimensions, viz. 24 inches long, 1 inch broad, and half an inch thick; these six bars were then tried precisely in the same manner as in the last experiments. The results were as below:

Preceding Table continued.

Description of Metal.		East Compass.				West Compass				Means.	
		End A.		End B.		End A.		End B.			
		°	′	°	′	°	′	°	′	°	′
Soft iron.	No. 1.	21	30	23	10	22	0	22	30	22	15
	No. 2	17	10	27	10	17	20	27	10		
Soft shear steel.	No. 1.	13	20	17	0	not obser.		not obser.		15	0
	No. 2.	12	30	17	10						
Hard shear steel.	No. 1.	10	0	14	0	not obser.		not obser.		12	17
	No. 2.	17	40	7	30						

"In these experiments, the distance between the bottom of the bar and the centre of the compass was 5·2 inches.

"The same remarks apply to these experiments as to the foregoing; viz. that each bar of the same kind of metal gives very nearly the same mean result, notwithstanding the difference in the action of their extremities.

"I could only procure one small specimen of cast steel, viz. a bar 9 inches long and 7-8ths of an inch square: but, in order to continue the comparison I had begun, I procured an iron bar of the same dimensions, and tried this latter, first against the steel bar rendered soft, and then against the same when hardened. The following are the results.

Attraction and Repulsion.

Preceding Table continued.

Description of Metal.	East Compass.				West Compass.		Means.	
	End A.		End B.		End A.	End B.		
	°	′	°	′			°	′
Soft Iron - -	16	20	17	20	not	obser.	6	50
Cast steel, oft	14	20	11	0	not	obser.	12	40
Cast steel, hard	8	0	8	45	not	obser.	8	22

"By collecting the mean results from the three preceding tables, and comparing in each the particular deviations with the corresponding deviation produced by the iron bar, assuming also the tangents of the several angles as the measures of the deflecting power, and that due to the iron bar as unity, we shall have the relative power of the different kinds of metal, as in the last column of the following table:

Table of the proportional magnetic powers of different descriptions of iron and steel.

Description of Metal.	Angles of deviation		Tangent.	Proportional magnetic power.
	°	′		
Cast Iron - -	7	48	·1369	·479
Malleable Iron -	15	54	·2843	1·000
Blistered steel, *soft*	10	50	·1913	·673
Blistered steel, *hard*	8	37	·1515	·532
Malleable iron -	22	15	·4091	1·000
Shear steel, *soft* -	15	0	·2679	·655
Shear steel, *hard*	12	7	·2177	·530
Malleable iron -	16	50	·3025	1·000
Cast steel; *soft* -	12	40	·2247	·743
Cast steel, *hard* -	8	22	·1470	·486

"Or if we express these ratios by the nearest integral numbers, they will stand thus:

Malleable iron .	100	Shear steel, hard .	53
Blistered steel, soft,	67	Cast iron . . .	48
Blistered steel, hard,	53	Cast steel, soft .	74
Shear steel, soft .	66	Cast steel, hard .	49

Comparison of the magnetic power of cast and malleable iron, when heated in a furnace.

"For the purpose of these experiments, I procured a bar of soft iron, 25 inches in length, and 1¼ inch square, and a cast-iron bar of the same dimension; but having destroyed the latter by giving it too great a heat in the first experiment, I could only find one of nearly the same size; the length of the new bar was the same, but its side was only 1$\frac{5}{16}$ths of an inch.

"The compass was placed nearly level with the upper extremity of the bar, and at the distance of six inches, the latter being inclined, as in the former experiments, in the direction of the dip.

The following are the results:

Experiment I.

Cast-iron cold.	End A, deviation	21° 30′	mean 21° 30′
	End B,	21 30	
Ditto, white heat, zero; blood-red		- 62 0	

Experiment II.

Maleable iron cold.	End A, deviation	37° 0′	mean 40° 0′
	End B,	43 0	
Ditto, white, zero; blood-red		- 55 0	

These two experiments were repeated with exactly the same results.

The positions of the bars were now changed, viz. they were raised about 2 inches, but the dip was still observed.

Experiment III.

Cast-iron cold	End A, deviation	24° 20′	mean 24° 20′
	End B,	24 20	
Ditto, white heat, zero; blood-red		78 30	

Experiment IV.

Maleable iron cold.	End A, deviation	
	End B, not observed.	
Ditto, white heat, zero; blood-red		70° 30′

These experiments were repeated with the same results.

"I should observe here, that the great attraction produced by the heat did not subside with it, provided the bar remained in its place undisturbed; for after some days I found the power of the bar continue just the same as at the time of making the experiment, when it had not been displaced; but then the bar upon trial was always found to possess a certain degree of fixed magnetism, its other extremity producing an opposite effect upon the needle; but if the bar was inverted, while it retained any visible colour from the heat, both ends produced exactly the same deflection: as to the magnetic effect to which I have alluded above, it was lost, or at least a great part of it, after leaving the bar for some time horizontal, or after its being thrown about with other pieces of iron.

"It is also proper to observe, that the needle always began to indicate the power of the iron upon it as soon as it arrived at that state of temperature shown by a high blood-red heat, and its motion generally proceeded gradually till it had reached its maximum deviation, which it commonly attained in about a minute or two. It will be remarked as very singular, that cast-iron, which is so decidedly inferior in its action when cold, should possess a superior power when hot, which happened uniformly in every experiment that was made, the two bars being placed under like circumstances; it is moreover to be remembered that the cast-iron bar was 1-16th of an inch less in its lateral dimensions, which ought, and necessarily did, diminish its actual power of attraction. Its comparative power is therefore greater than that stated above.

Comparison of the magnetic power of soft iron and shear steel, when heated in a furnace.

The bars employed in these experiments were those whose effects are recorded in our second table. The results were as follow:

Experiment V.

Malleable iron cold,	End A, deviation	16° 30′	mean 15° 10
	End B,	13 30	
Ditto, white heat, zero; blood-red		- 41 10	

Experiment VI.

Soft shear steel cold,	End A, deviation	11° 30	mean 11° 0′
	End B,	10 30	
Ditto, white heat, zero; blood-red		- 48 0	

Experiment VII.

Hard shear steel, cold.	End A, deviation	15° 30′	mean 8° 0′
	End B,	0 30	
Ditto white heat, zero; blood-red		- 47 30.	

"The only positive deduction which we are able to make from these experiments is, that soft iron, whose power is so far superior to every other kind of iron and steel when cold, is inferior to any of them when heated; and that cast-iron, which has the least power cold, is equal, or superior to any, when hot. But there is certainly not so decided a scale of relation in this case as in the experiments on the cold bars, the principal reason for which may be the damage sustained by the iron by being repeatedly heated.

"I should, therefore, now have concluded my experiments on this subject, but for a circumstance which had been noticed, and which strongly attracted our attention. It had been observed, both by Mr Bonnycastle and myself, in some of the preceding experiments, and others of which I have not given the results, that between the white heat of iron, when its power was actually zero, and the blood-red heat, at which its action manifested itself so highly, there was an intermediate state of the bar, during which it attracted the needle the contrary way to what it did when cold, viz. if the north end of the needle was attracted in the latter state, the south end was attracted while the heated iron passed through the shades of colour denoted by the workmen the *bright red*, and *red heat*. Our object was, therefore, now to examine this circumstance a little more minutely than we had hitherto done.

On the anomalous attraction of heated iron, which takes place while the metal retains the high red and simple red heat.

"In our first experiment the compass was placed nearly west of the bar, rather below its upper extremities, and distant from it about 6$\frac{1}{2}$ inches. At the white heat the attraction of the iron was lost, and at the blood-red heat we had more than 70° of deviation; but that intermediate action we were searching after did not appear, at least it was by no means so obvious as we had noticed it in our preceding experiments. The position of the bar and compass, however, was not quite the same as before; we, therefore, raised the stand for the bar about four inches, by which means its upper extremity was about the same height above the compass; and on repeating the experiment with the bar thus placed, we obtained an obvious deviation of the south end of the needle to the bar of 4½°, which remained fixed for about two minutes.

"Having gained this by raising the bar four inches, we now raised its base six inches; and on applying it in this place, we obtained a deviation of 10½°, which remained fixed about the same time as before, when the needle suddenly yielded to the natural magnetic power of the iron, and obtained almost instantaneously a deviation of 81° the opposite way.

"It was thus rendered obvious that the quantity of negative attraction, at the red heat, depended upon the height or depth of the centre of the bar; and as the natural effect of the cold iron was changed by placing the compass below the centre of the bar, the next question was, will the character of the negative attraction change also? To decide this point, we lowered our compass to within six inches of the bottom of the bar, in which position the cold iron attracted (of course) the south end of the needle, and produced a deviation of 21°; and upon being heated, we found as usual all its powers upon the needle cease at the white heat; but as this subsided into the bright red, the negative attraction begun to manifest itself, and it soon amounted to 10½°; the north end of the needle being attracted towards the iron: it remained stationary for a short interval, and then gradually returned, first to due north, and ultimately to 70° 30′ on the opposite side.

"I now determined upon making a regular course of experiments, with a view, if possible, to trace this anomalous action to some fixed principle; for it will have been noticed, from what is stated above, that the negative attraction appeared to increase from each extremity of the bar towards its middle; whereas the positive or natural action of the iron decreases in the like cases, and, passing through zero in the plane of no attraction, has its quality of action different when placed towards the upper and lower extremity of the bar. But the negative attraction, which is also different in two opposite halves of the bar, seemed to pass through a maximum to arrive at this change of quality, which appeared wholly inexplicable; and after all the experiments I have made, I must acknowledge that it still remains so. It is at all events certain, that the least change of position, when the compass is opposite the centre of the bar, will change altogether the quantity and quality of this negative action.

"I should have been glad, in pursuing this inquiry, to have been able to use balls of iron instead of bars; and I made one experiment to see how far it was practicable; but the heat was so intense, that I found it inconvenient, and relinquished this plan for that which I had hitherto pursued.

"The result of the ball experiment was as follows: attraction cold × 13° 31′: white heat 0° 0′: red heat — 3° 30; blood-red heat × 19° 30′.

"It may be proper also to observe, that having some doubt whether the effect I had observed was due to any change in the attractive power of the iron during its change of colour, or whether it might not proceed merely from the heat, I procured two copper bolts, of rather larger dimensions than the iron bars, and had them heated to the highest degree *that* metal would admit of; but upon placing them, when thus heated, in the same situation as the iron bars, no action whatever upon the needle could be detected.

"The time occupied in each experiment was about a quarter of an hour; the white heat commonly remained about three minutes, when the negative attraction commenced; this lasted about two minutes more, and then the usual attraction begun to indicate its presence; this arrived at its maximum sometimes very rapidly, but at others it proceeded increasing very gradually, and commonly in a quarter of an hour from the beginning the needle had been found perfectly stationary.

"All the above experiments, it will be observed, were made with the iron bar inclined in the direction of the dipping needle, or nearly in that direction, (for the greatest accuracy was not observed in this respect,) and it follows from them, as is stated above, that the negative attraction was the greatest opposite the middle of the bar, where the cold attraction was very small, or zero. I was therefore anxious to ascertain what the effect would be at the red heats, when the bar was placed in a direction perpendicular to the former, or in what I have denominated the plane of no attraction. We accordingly made a few experiments with the bar in this position, but the results were by no means so strongly marked as in the preceding table. We always obtained a certain quantity of negative attraction, as in the former cases, but its amount was very inconsiderable; in no instance exceeding 2½°.

"The only explanation which seems to present itself of the cause of this anomalous action, is, that the bar cooling faster at its extremities than in its centre, one part of it becomes magnetic before the other, and hence gives rise to the irregular action above indicated. It must be acknowledged, however, that this explanation does not meet entirely all the phenomena recorded in the preceding table."

COMMUNICATION OF MAGNETISM.

It is well observed by Dr Robison, that we do not know the internal process by which magnetism is induced, or even in what magnetism itself consists. All that we know is, that the bringing the pole of a magnet near to any magnetisable matter, produces a magnetism of the kind opposite to that of the pole employed. We know that this is the case with both poles, and that it obtains at all the distances where magnetism is observed. We know that the action of one pole is contrary to that of the other, that is, it counteracts the other, prevents it from producing its effect, and destroys it when already produced; and we know that the production of these effects resembles in its result the protrusion of something fluid through the pores of the body, constipating it in all remote parts, as if the virtue of a pole resided in this moveable matter. This is nearly all that we know of it; and by these facts and motives we must judge of the propriety and effect of all the processes for magnetising bodies.

1. *Method of magnetising practised by the philosophers of the seventeenth century.*—This method consisted in merely rubbing the steel bar to be magnetised, at right angles, upon one of the poles of either a natural or an artificial magnet. This simple process was afterwards greatly improved by beginning the friction at the centre. The north pole was applied at the centre or middle of the bar, and drawn over the oval intended for the south pole. Having done this several times to one end in both sides, the operator turned the magnet, applying its south pole to the middle of the bar, and drawing it several times over the end intended for the north pole. The method was subsequently still farther improved, by employing two magnets at once, and drawing them away from each other over the ends of it; repeating the operation till the impregnation was complete.

2. *Dr Knight's method.*—Having joined, by their contrary poles, two strong magnetic bars, placed in the same line, he laid the middle of the bar which he intended to magnetise exactly over their point of junction; the bar having been tempered at what the workmen call a *cherry-red heat.* He then separated the bars, drawing them straight from each other, and, by this means, each half was passed over the pole of the contrary name to that which was intended to be given to the corresponding ends of the needle or magnet, and which thus acquired a more intense degree of magnetism than had hitherto been obtained. Dr Knight also invented a particular sort of ferruginous paste, of which he made a certain kind of bars which manifested a very high degree of magnetic intensity.

3. *Du Hamel's method.*—This philosopher placed parallel to each other two bars of steel of the same length, and united their extremities by two small prisms of soft iron, so as to form a right angled parallelogram. He next took two bundles of bars, previously magnetised, or two strong magnets, and united their poles of different names towards the middle of one of the bars of steel; after which, inclining the two magnets, he made them pass towards each extremity of the bar; and, by a successive repetition of this friction upon each of the bars, he obtained a considerable degree of magnetism.

4. *Michel's method.*—This gentleman employed two bundles of bars strongly magnetised, and parallel to each other, the poles of contrary name being united at each extremity. This was, however, done in such a manner, that there remained between them an interval of about one-third of an inch. He then placed, in the same straight line, bars which he wishto magnetise, passing over these bars at right angles, and in the direction of the line formed by them, one of the extremities of the double bundle. By this method he found that the intermediate bars acquired a great magnetic force.

5. *Method of Epinus.*—The process adopted by this philosopher differed from that followed by Duhamel, in the circumstance that he allowed the poles of the two systems of magnets to move at a small distance from one another, and inclined them in an opposite direction. He also united the ends of the bars with strong magnets instead of soft iron, as employed by the others; and thus produced a more powerful developement of magnetism, at least whenever the bars were of considerable dimensions.

6. *Coulomb's method of forming systems of Magnets.* The ingenious person now named employed steel bars, tempered at a cherry-red heat, having a length of about 21 or 22 inches, breadth six-tenths of an inch, and a thickness of one-fifth. These being separately magnetised to saturation, they were united by their poles of the same name, and formed into beds of five bars each, separated by small parallelopipeds of soft iron, and which projected a little beyond their extremities. These formed his fixed batteries. The moving bundles he commonly formed of four bars of tempered steel, similar to the above, 16 inches long, three-fifths of an inch broad, and one-fifth thick. After magnetising them as strongly as possible, he united two of them by their widths and two by their thicknesses, which gave to each bundle or system a width of 1·2 inches, and a thickness of two-fifths of an inch.

M. Biot recommends an improvement on this method, which he has found, from experience, to be of considerable importance. This consists in making the centre magnet project a little beyond those nearer the sides, the centre one having the greatest projection. The whole is bound together with a collar of soft iron, and held firmly by a screw. With this arrangement the operation of magnetism is performed by placing the large bundles in the same straight line, so that their north and south poles are opposite to each other. The bar to be magnetised is then placed upon one extremity of their corners, in such a manner that it goes very little over it; after which two moving bundles are placed upon the centre of the bar, with the south pole of the one opposite to the north pole of the corresponding fixed bundle, and the two moveables ones inclined at an angle varying from 15° to 20°. This being done, we may proceed according to the methods either of Duhamel or Epinus; and it was in this way that Coulomb was enabled to make the comparison between these two processes, which are elsewhere detailed, and have a reference to his ingenious instrument called the *balance of torsion.*

7. *Canton's method of magnetising bodies.*—The following outline of his process is abridged from the Philosophical Transactions. "Procure a dozen bars, six of soft steel, each three inches long, one quarter of an inch broad, and 1-20th of an inch thick; with two pieces of iron, each half the length of one of the bars, but of the same breadth and thickness; and six of hard steel, each five inches and a-half long, half an inch broad, and 3-20 of an inch thick; with two pieces of iron of half the length, but the whole breadth and thickness of one of the hard bars; and let all the bars be marked with a line quite round them at one end.

Then take an iron poker and tongs, or two bars of iron, the larger they are, and the longer they have been used, the better; and fixing the poker upright between the knees, hold to it, near the top, one of the soft bars, having it marked, end downwards, by a piece of sewing silk, which must be pulled tight with the left-hand, that the bar may not slide; then grasping the tongs with the right-hand a little below the middle, and holding them nearly in a vertical position, let the bar be stroked by the lower end from the bottom to the top, about ten times on each side, which will give it a magnetic power sufficient to lift a small key at the marked end, which end, if the bar were suspended on a point, would turn towards the north, and is therefore called the north end, and the unmarked end is, for the same reason, called the south.

Four of the soft bars being impregnated after this manner, lay the other two parallel to each other, at the distance of about one-fourth of an inch between the two pieces of iron belonging to them, a north and a south pole against each piece of iron; then take two of the four bars already magnetical, and place them together, so as to make a double bar in thickness, the north pole of one even with the south pole of the other, and the remaining two being put to these, each on one side, so as to have two north and two south poles together. Separate the north pole from the south pole at one end by a large pin, and place them perpendicularly with that end downwards on the middle of one of the parallel bars, the two north poles towards the south and the two south poles towards the north end; slide them backwards and forwards three or four times the whole length of the bar, and, removing them from the middle of this, place them on the middle of the other bar as before directed, and go over that in the same manner; then turn both the bars the other side upwards, and repeat the former operation; this being done, take the two from between the pieces of iron, and placing the two outermost of the touching bars in their stead, let the other two be the outermost of the four to touch these with; and this process being repeated till each pair of bars has been touched three or four times over, it will give them a considerable magnetic power.

8. *Captain Scoresby's method.*—A paper by this enterprising seaman was communicated, in 1822, to the Royal society, entitled Experiments and Observations on the developement of Magnetic Properties in Steel and Iron by Percussion. For the purpose of his experiments, several hammers of different weights were employed, and the magnetical effects resulting from the process were measured, both by ascertaining the deviation on a needle, and by the weight lifted. He prefers the former of these tests, the effect of the latter being much influenced by the nature of the surfaces in the particular specimens of steel and iron which happen to be used, and by the degree of contact of which they are thereby rendered susceptible.

" The strong magnetising effect of percussion on soft steel, induced me," says the captain, " to apply the property to the formation of magnets. For this purpose I procured two bars of soft steel, 30 inches long and an inch broad; also six other flat bars of soft steel, eight inches long and half an inch broad, and a large bar of soft iron. The large steel and iron bar were not, however, absolutely necessary, as common pokers answer the purpose very well: but I was desirous to accelerate the process by the use of substances capable of aiding the developement of the magnetical properties in steel. The large iron bar was first hammered in a vertical position; it was then laid on the ground, with its acquired south pole towards the south, and upon this end of it the large steel bars rested while they were hammered; they were also hammered upon each other. On the summit of one of the large steel bars, each of the small bars, held also vertically, was hammered in succession, and in a few minutes they had all acquired considerable lifting powers. Two of the smaller bars, connected by two short pieces of soft iron, in the form of a parallelogram, were now rubbed, with the other four bars, in the manner of Canton; these were then changed for two others, and these again for the last two. After treating each pair of bars this way for a number of times, and changing them whenever the manipulations had been continued about a minute, the whole of the bars were at length found to be magnetised to saturation; each pair readily lifting above eight ounces."

THEORIES OF MAGNETISM.

Dr Gilbert's theory.—All the phenomena of natural magnetism are analogous to what we should observe if the earth were a great magnet, having its poles near the poles of the earth's equator, the north pole not far from Baffin's Bay, and the south pole nearly in the opposite part of the globe. A dipping needle, under the influence of the great magnet, must arrange itself in a plane which passes through the pole of the magnet, the position of which plane is indicated (at least nearly) by the ordinary compass needle; and it will be inclined to the horizon so much the more as we recede from the equator of the great magnet.

Halley's theory.—According to Dr Halley's original notions on this head, the magnetism exhibited by the earth was caused " by four poles or points of attraction, two of them near each pole of the equator; and that in those parts of the world which lie nearly adjacent to any one of these magnetic poles, the needle is governed thereby, the nearest pole being always predominant over that more remote. As near as conjecture can reach, (said he,) I reckon that the pole which is at present nearest to us lies in or near the meridian of the Land's End, and not above 7° from the north pole." The other north magnetic pole was supposed to be on the meridian of California, and about 15° from the pole of the earth." The two south poles he conceived to be situated, the one about 16° from the southern terrestrial pole, and in a meridian about 20° to the westward of Magellan's straits, or 95° west of London. The other, which he supposed the greatest or most powerful of the four, was conceived to be 20° from the south pole of the earth, and in about 120° east longitude of London. By means of these, the author endeavoured to explain the various bearings of the needle in different parts of the world. But as he had made no provision for the *change of variation,* he proposed, some years afterwards, his new theory, in which the exterior surface of the earth is considered merely as that of a hollow shell. He supposed that within this shell there is a solid globe performing its rotations, in nearly the same time as the earth, about the same centre of gravity. He farther supposed, that this globe has two magnetic poles, and the shell two others; and that the *variation in the variation* is caused by the want of coincidence in the periods of the times of rotation of the globe and shell. We have not room for details on this head, and they are the less necessary, inasmuch as the hypothesis of Dr Halley has given place to others of a more modern date, which occupy at present the attention of the curious, and which, it is probable, are doomed, at no distant period, to be succeeded by others equally ingenious, and as little allied to the truth of nature.

Law of Magnetic Action.

The true law of magnetic attraction was long unknown or mistaken. Newton, and several of his commentators, imagined the force with which that principle acts to be inversely as the cube of the distance. Mayer and Lambert were led, by their experiments, to conclude that the inverse square of the distance was the true expression of this law; but it was not till the year 1786 that Coulomb succeeded in establishing this principle on grounds at all satisfactory. The same doctrine was afterwards confirmed by the investigations of Professor Hanstein; and no doubt any longer remained in regard to the soundness of the views propagated by the German philosophers just named, when some valuable lights were thrown on the subject by Mr Barlow.

The experiments performed by this ingenious enquirer are known to every one who has taken any interest in the progress of magnetic science, and will deserve a place even in the most abridged view that is given of its history. In order to arrive at some distinct ideas relative to the attraction of detached masses of iron, differing in magnitude, in distance, and in position with regard to a magnetized needle, he commenced with masses of known size, and placed them at distances, and in positions, susceptible of correct mensuration. Thus, he took an iron ball of known diameter, and observed its effect upon a needle, in different points of the circumference of a horizontal circle, whose centre is the point of suspension of the needle: Then he traced the effect when the same ball was placed upon different points of the circumferences of larger circles having the same centre: And, after this, he took another iron ball of larger diameter, and placed it in succession upon different points of the same series of concentric circles in a horizontal plane. The results were striking; but, detecting some defects in his apparatus, he went rather differently to work.

A strong wooden table, with copper fastenings, nearly five feet in diameter, was constructed, and its feet fastened to four piles which were driven into the ground; thus preventing, or considerably diminishing, the tremulous motion of compass needles placed upon the table. In its central part was cut a circular orifice 13¼ inches in diameter, in order that balls and shells of different sizes might be elevated and depressed vertically, and by means of pulleys (from which all iron was carefully excluded) made to rest with their centres either coinciding with the horizontal plane of the table, or at any proposed distance above or below that plane, at the pleasure of the operator. The magnetic meridian being carefully laid down upon this table, and a series of concentric circles described, permanent marks were made upon each of them at equal divisions of 2½ degrees, all round, commencing at the diameter which coincided with the magnetic north and south. With an apparatus thus contrived, the centre of any ball employed in the experiment would always be posited somewhere in the vertical line which passes through the centre of the table, while the centre of the needle might be placed on any proposed point in the circumference of one of the circles. So that, by the aid of no very difficult computation, the conductor of the experiments could ascertain, not only the angular position of the compass with the magnetic meridian, but the inclination of the line which joins the centre of the needle and that of the ball.

On placing a compass successively at the different points of the circumference of one of the circles, while the ball (say one of eight inches diameter) remained at the centre, Mr Barlow found generally, as might have been expected, that there was a deviation in the needle, east or west, greater or less, according to circumstances, except when the centre of the needle was placed in the magnetic meridian drawn through the centre of the ball; also, that when the compass was so posited, whether north or south of the ball, no elevation or depression occasioned the least perceptible change in the position of the needle. This natural result Mr Barlow announces, by saying, that a vertical plane drawn through an iron ball to coincide with the magnetic meridian, is a plane of no attraction upon the needle of a compass placed within it.

But farther, our author found, that if he placed the compass on any point out of this plane, as he moved the ball from above downwards in the same vertical, he produced in the needle first an easterly and then a westerly, or first a westerly and then an easterly deviation: from which he inferred, that in each of those cases there must be some position of the ball in which the deviation was *zero*, or in which the matter of the ball did not attract the needle. Pursuing his inquiries, he soon found that these points all lay in, or nearly in, one plane with regard to the ball: and Dr Gregory, who, as well as some other of Mr Barlow's colleagues, took great interest in these researches, suggested the probability that this plane would be found *perpendicular* to the direction of the dipping-needle, or would coincide with what might fitly be denominated the *magnetic equator* of the ball. This suggestion Mr Barlow soon put to the test, tabulating and computing his results with great perseverance till he placed the matter beyond the reach of doubt. Thus, setting the compass at every second division (of 5°) upon one of his circles, elevating and depressing the ball till the deviation of the needle vanished, and computing the corresponding inclination of the plane, he obtained seventeen results, of which sixteen gave the inclination between 19° 1′ and 19° 35′, the mean of the whole being 19° 24′. The results of other experiments with different balls gave nearly the same mean. Shortly afterwards, he made forty distinct trials to determine the dip or inclination of the dipping-needle, viz. ten face to the east, and ten face to the west, and subsequently ten more in each direction with the poles inverted. The means of each series were 70° 35′·1, 70° 25′·9, 70° 28′·2, 70° 32′·6, respectively: of these the ultimate mean gave 70° 30′·45 for the dip at Woolwich, July 13, 1819. The complement of this, namely, 19° 29′·15, differs from the mean inclination of the plane of no attraction by less than six minutes, a deviation which falls far within the limits of the diurnal changes in the dip.

We have traced the process by which this curious result was obtained with some minuteness, because we regard it as an essentially new discovery in this department of science. We deliberately employ the phrase "essentially new," from a persuasion that it is not merely a newly elicited fact, but one that cannot, by a fair and legitimate train of reasoning, be deduced from any other fact already known, or any theory of magnetism previously received. No person that we are aware of, before the annunciation of Mr Barlow's researches, has thrown out the remotest conjecture of any other plane of *no attraction*, in reference to a ball or shell of iron, than the vertical plane which coincides with the magnetic meridian.

This interesting result being satisfactorily established, Mr Barlow proceeded in his inquiries with fresh ardour and activity. Considering any circle in this oblique plane of no attraction, or magnetic equator, as an equator to an ideal sphere concentric with the ball or shell, and imaginary circles of latitude and longitude to be drawn on each sphere, the first meridian being supposed to pass through the (magnetic) east and west points, he attempted next to determine the law of attraction as it regarded the *latitude*, and then the modification of the law as it respected the *longitude*. This investigation required a judicious union of experiment and mathematical computation, without the aid of the latter of which no useful general proposition could, in this branch of the inquiry, be obtained. The inferences indubitably drawn from this combination are,—1st, That while the compass is carried round the globe in a great circle passing from the east and west points of the horizon, perpendicular to the magnetic equator, "the tangent of the angle of deviation is proportional to the rectangle of the sine and cosine of the latitude, or to the sine of the double latitude, the longitude being zero." 2dly, That while the mass and distance are the same, "the tangent of the deviation is proportional to the rectangle of the cosine of the longitude, and the sine of the double latitude."

"Instead," says the author, "of conceiving the imaginary sphere to surround the ball, we may imagine a similar sphere concentric with the pivot of the needle; then it is obvious that the centre of the ball will have the same relative position on the latter sphere as the pivot of the compass has with respect to the former; so that the reference may be made to either at pleasure: but when the mass of iron is *irregular*, it will then be preferable to refer the common centre of attraction of the iron to the imaginary sphere circumscribing the compass."

Experiments were next instituted to determine the law of magnetic attraction in reference to *distance*. The conclusion is, that the tangents of the angles of deviation are reciprocally proportional to the cubes of the distance. Or, if the inference of Æpinus and Coulomb be admitted, that the force of magnetic attraction varies inversely as the squares of the distances, then the law will become "the tangents of the deviation are directly as the force, and reciprocally as the distance."

In pursuing the investigation for ascertaining the law of attraction as it depends upon the *mass*, Mr Barlow found, that, whether a ball or shell were employed, if the diameter were the same, the results as to attraction were the same at equal distances. Within certain limits as to thickness, the power of attraction seemed to reside *principally, if not wholly, in the surface*, and to be independent of the mass. This, it will be observed, is altogether different from the doctrine of Bernouilli and Trembley: they affirmed that the forces *of magnets* were as their surfaces; here the truth announced is, that the forces of *masses of iron* upon a magnetized needle are as their surfaces.

"Upon the whole," says Mr Barlow, "I may venture to conclude, that the magnetic power resides wholly on the surface of iron bodies, but that a certain thickness of metal is necessary for its complete developement; a striking instance of the intimate analogy which subsists between the magnetic and electric fluids."

Thus far the several propositions deduced from our author's train of inquiry may be comprehended in the general formula

$$\tan \Delta = \frac{D^{3}}{A\ ^{3}} (\sin 2 \lambda \cos l),$$

where Δ is the angle of the needle's deviation from the magnetic meridian, λ the latitude, and l the longitude on the ideal sphere, D the diameter of the ball or shell, d the distance of the centre of the ball from the pivot of the needle, and A a constant co-efficient to be determined by experiment.

Our author proceeds to the actual determination of this co-efficient for the latitude of London, and explains the principles upon which its modification in other latitudes will depend. At the same time, however, he recommends that the point be ascertained in other countries as well as here by cautious experiments.

After recording some interesting experiments on the action of thin plates of iron upon a magnetized needle, Mr Barlow, in order to elucidate the corresponding action of irregular masses, describes his "experiments on a twenty-four pounder gun, on a traversing platform, in the Royal Military Repository." We regret that we cannot, without greatly exceeding our proposed limits, quote largely from this section: the author is fully borne out in the language with which he terminates it.

"These experiments will, I trust, be quite sufficient to satisfy every one, that the same laws which

I first obtained from observation on *regular* masses of iron are equally applicable to *irregular* masses, and that they furnish us with the means of computing the local attraction of a ship's guns upon her compass, under all circumstances, and in all parts of the world; at least, *if* (as there is the strongest reason to believe) *the plane of no attraction varies its position in different latitudes, so as to be everywhere inclined to the horizon at an angle equal to the complement of the dip.*"

For the purpose of subjecting this probable inference to the test furnished by recent experiment in a high latitude, Mr Barlow institutes a comparison between the deviations of the needle as computed from his own formula for the dip 74° 21′, and the real deviations as observed by Captain Sabine on board the Isabella, in Brassa sound, Shetland. The correspondence is quite as great as could rationally be expected.

It will now be seen, as we have before hinted, that Mr Barlow's entire course of experimental deduction has constant reference to a most momentous practical application, to which he is, all along, approximating. Were there no iron, or other substance capable of magnetic action, aboard a ship, and were the compass freed from the defects which we have described at the commencement of this article, the needle would at once enable the mariner to ascertain the *true north* in any part of the world, by applying the correction for the needle's "variation," which is either known or readily determined by the aid of a simple astronomical observation. But, instead of this, how stands the case in fact? Every iron gun, every ball or shell, every iron bolt or screw, nay *every nail*, in a ship, has its greater or less tendency, according to its respective circumstances of magnitude, position, and distance, to disturb the needle, and ultimately to render it quiescent when out of the magnetic meridian. The consequence is, that what has been, till very lately, regarded as the actual "variation" of the compass, in any part of the world, on shipboard, is *not* that variation simply, but blended with a "deviation" arising from the aggregate of these local attractions, which is not probably the same aboard any two ships, and which, therefore, cannot be estimated and allowed for in one ship through the medium of experiments in another. It hence follows, too, that it cannot with any degree of confidence, nay, of probability, be affirmed, that we know the real variation in any part of the immense oceans of our globe; and farther, that every theory of "variation," and every determination of the magnetic poles of the earth, from the time of Halley down to the present, is essentially erroneous. How is this varying but always important quantity, the "deviation" from local attraction, to be estimated, and separated from the variation?—that is, how are the errors in all preceding theories to be measured and allowed for?—or, which is of more immediate moment, how is the mariner to extricate himself from the danger to which he is always exposed by a wrong reckoning of his course, occasioned by his considering that as variation merely, which is variation affected by another quantity often of considerable magnitude? Mr Barlow's reply to these questions is at once simple, and practicable; and we are inclined to think that a fair trial will prove it satisfactory.

Supposing that the iron of the vessel and the compass will retain the same, or nearly the same, relative position, during a voyage, he conceives it possible to place a single ball, shell, or even plate of iron, in a certain, ascertainable, situation in the ship, where its effect upon the needle would be the same as that of the iron in its actually distributed state. Or, conceiving naturally that all the forces which act upon the needle aboard the vessel, may be reduced to what is technically called a single "resultant," he assumes that a less mass of iron, having its centre of attraction or resultant in the same line as the former, may be brought so near to the compass as to produce an effect equal to that of all the iron in the vessel: thus the tangent of the deviation may at any time be doubled, and hence the deviation itself determined. Mr Barlow presents in his twelfth section the theorem by which this reduction may be effected; and it would have been easy to draw up a little table from which the required angle might be taken by inspection: but where the deviation does not exceed nine or ten degrees, it will always be sufficiently correct to take *half* the angle produced by the application of the shell or plate for the angle of deviation sought. The angle whose tangent is equal to half the tangent of 20° is 10° 18′; which only differs from 10°, by 18′, a quantity scarcely susceptible of correct estimation by a common ship's compass.

Mr Barlow describes a simple apparatus, by which, as he conceives, all this may be readily accomplished on board a ship. He has shown experimentally that the principle applies completely to the different positions of a gun, which with its appendages contains fifty-eight cwt. of iron: and he has fitted up a ship's binnacle with an attached apparatus, so as to exhibit (allowing for the difference in the *dip*) all the errors observed by Captain Sabine in the Isabella's compass, in Brassa sound, Shetland.

The whole of this developement of facts appears to have been so skilfully conducted, and the successive links in the chain of induction so cautiously united, that it would seem reasonable to expect a satisfactory issue of the proposed experiment in any part of the world. The questions to be resolved by such an experiment are,—Will a process which serves to measure the attraction of irregular masses of iron on land, answer the same purpose on board a ship? Will a process which succeeds in one latitude, be equally successful in any other? We can assign no reason why it should not: and the process is so simple, the expense so trifling, and the evils to be escaped by means of the experiment, if successful, so momentous to a commercial nation, that we trust Mr Barlow's plan will soon receive a fair, adequate, and decisive trial.

Considering the novelty and importance of the deduction, that the magnetic power of iron bodies resides wholly on their surface, it was to be expected that philosophers would attempt to verify it by distinct experiments, before they would admit it as an established philosophical fact: And this task was first undertaken by Captain Kater, who published the result of his experiments in the *Philosophical Transactions* for 1821. For these experiments, he had three cylinders made of soft iron, and about 2½ inches in diameter, and nearly the same in height. One of the cylinders was of sheet iron, less than one-tenth of an inch in thickness: the second, of that sort called chest-plate, 0.185 inch thick; and the third was of solid wrought iron. The first weighed 2760 grains, the second 9376 grains, and the solid cylinder 22929 grains. Previous to the experiments, they were all made red hot, to destroy any accidental magnetism. The compass employed was of a very delicate construction, and the cylinder was so placed, that its centre was in the direction of a tangent to the zero of the compass, and at the distance of 485 inches from the southern extremity of the needle. The position of the cylinder was varied six times, and the following were the deviations of the needle:

	Sheet Iron Cylinder.		Chest Plate Cylinder.		Solid Cylinder.	
	2°	1′.5	2°	50′	2°	55′
	2	1.5	3	4	3	15
	2	4.5	3	20	2	57
	2	5.	3	45	2	50
	2	5	3	10	2	55
	2	10	3	30	2	30
Mean	2	16	3	16	2	54

Suspecting, from an accident which occurred, an error in the experiment with the solid cylinder, Captain Kater repeated the whole with the utmost attention. The position of each cylinder was now varied eight times, and the mean results were as follows:

Sheet iron cylinder, 2° 19′. Chest plate cylinder, 3° 16′. Solid cylinder, 3° 4′.

The surfaces of the cylinders, determined by very careful measurement, were, the iron sheet 28.54 inches; the chest-plate 30.77 inches; and the solid cylinder, 28.94 inches.

Reducing the deviations to the same extent of surface, viz. to that of the solid cylinder, they became respectively 141, 184, and 181 minutes; which may be considered as a highly satisfactory verification of the law in question.—See *Phil. Trans.* Part I. for 1821.

VARIATION OF THE COMPASS.

Among the many ingenious and industrious writers to whom the present age is indebted for a great addition to the knowledge formerly possessed on the subject of magnetism, we believe there is not one entitled to a higher place than Mr Bain of the royal navy, the author of a very valuable "Essay on the Variation of the Compass. From the works of others, as well as from his own observations, he has brought together a great variety of facts illustrative of that singular property in the magnetic energy. The following statements are abridged from his interesting volume.

Many years elapsed after the discovery of the compass, before it was thoroughly ascertained that the needle did not exactly indicate the true poles of the world; and it was not till the middle of the sixteenth century, that observations made in England and France clearly demonstrated this variation.

At London, in 1580, the quantity of variation was found to be 11° 15′ east; in 1622, 6° east; in 1634, 4° 5′ east; and in 1657, the needle coincided with the true poles of the world; so that a period of 87 years elapsed in changing the 11° 15′ of easterly variation in that city to zero, or until the variation began to take a westerly direction. In 1672, the variation was 2° 30′ west; in 1723, 14° 17′ west; in 1747, 17° 40′ west; in 1780, 22° 41′ west; and in 1793, (or 136 years afterwards,) the variation was nearly 24½° west.[1]

At Paris, in 1550, the variation was 8° east; and in 1660, the needle pointed to the true poles of the world. In 1681, the variation was 2° 2′ west; in 1760, 18° 20′ west; and in 1804, 22° 20′ west. Hence it follows, that whilst the variation was undergoing an annual change of 10′ 4″ during a period of 213 years at London, the yearly change at Paris during a term of 254 years, was only 7′ 10″.[2]

At Dublin, in 1657, the needle coincided with the true poles of the world. In 1791, the variation was 27° 23′ west; exceeding the variation observed in London 3° or 4°; and consequently the annual change, which was uniform, during 134 years, must have been about 12′ 10″.[3]

Whilst the variation was undergoing this change at London, Paris, and Dublin, we find an almost corresponding change at Cape Agulhas and the Cape of Good Hope. At the former of these places there was no variation in 1600; and in 1692, it amounted to 11° west. At the Cape of Good Hope, in 1700, the variation was nearly 10° west[4]; and in 1791, it had increased to 24° 31′ 52″ west[5]: so that, during a period of 91 years, the annual change in the variation at the Cape of Good Hope, must have been about 9′ 15″.

At St Helena, the variation in 1600 was 8° east; in 1623, 6° east; in 1677, 0° 40′ east; in 1692, 1° west; in 1776, 13° 15′ west; and in 1794, it was found to be 17° 16′ west[6]: consequently, the mean annual change in the variation at this place, during a period of 194 years, has been at the rate of 7′ 52″.

At Cape Comorin in 1620, the variation was 14° 20′ west; in 1688, 7° 30′[7]; in 1756, one quarter of a degree[8]; and in 1816, there was still no variation at this place[9]: therefore, during a period of 137 years, the annual change was 6′ 17″; but during a space of 59 years, that is, from 1757 to 1816, the variation has been *stationary*.

The phenomena presented by the variation at Cape Horn and its vicinity, are extremely different from those observed at the Cape of Good Hope, Paris, and London.

In 1683, in Lat. 57° 27′ south, Long. 57° 28′ west, the variation was found to be 23° 10′ east.[1] In 1775, in Lat. 56° 27′ south, Long. 54° west, 24° 30′ east variation was found.[2] In 1786, in Lat. 53° south, Long. 70½° west, 22° 47′ east variation was observed.[3] And in 1795, in Lat. 57° south, Long. 67° west, the variation was exactly 23° east.[4] Hence it follows, that, during a period of 112 years, the variation near Cape Horn has neither increased nor diminished in a perceptible manner.

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[1] Hutton's Math. and Philos. Dict. 1st edit. vol. ii. p. 634.

[2] Ib vol. ii. p. 638.

[3] Ib. vol. ii. p. 638.

[4] Philos. Trans. for the year 1757.

[5] D'Entrecasteaux's Voyage in Search of La Perouse.

[6] Bouditch, Epitome of Navigation, p. 149.

[7] Hutton's Math. and Philos. Dict.

[8] Philos. Trans. for the year 1757.

[9] Biot, Traite de Physique.

At Cambridge (Massachusetts) in 1708, the variation was found to be 9° west, and since that period it has been diminishing at the rate of 1¾′ annually;[5] whilst at Jamaica, Barbadoes, and Lima, the variation has undergone *no* change during a term of 140 years.[6] In the northern hemisphere, in the parallel of Spitzbergen, Davis' straits, Hudson's bay, &c. the same quantity of variation appears to have existed during a space of 150 years.[7]

The quantity of variation from Cape Comorin, eastward towards the Nicobar islands, Java, Ceram, Amboyna, Timor, &c. is so very small as seldom to induce navigators to advert to it in their calculations, and is subject to little or no change. It may, however, be worthy of remark, that, sixty miles east from the coast of Coromandel, about the meridian of Madras, the variation changes its denomination from east to west.

The same local changes probably take place on the coasts of Chili, Peru, and Mexico. In 1704, from Valparizo to Acapulco, a distance of 50° of latitude, the variation was very inconsiderable. From the former of these places to Lima, it never exceeded 3° east; from Lima to the latter never more than 4° west.[8]

"The greatest variation I am acquainted with, (says Mr Bain,) has been observed between Cape Farewell and Labrador, in Hudson's straits and Baffin's bay. In Lat. 52° north, Long. 52° west, I observed the quantity of 42° 10′ 53″ westerly variation;[9] and as high as Lat. 60° north, about the same parallel of Long. I found from 50° to 52°. I am, however, inclined to think this excess of variation must have been partially produced by the effects of local attraction.

In 1616, in Lat. 78° north, Long. 80° west, (Baffin's bay,) 57° westerly variation was found.[10] In 1757, in Lat. 62° north, Long. 65° west, 41° west variation was observed; and in the same year, in Lat. 63° north, Long. 79° west, 43° west variation was also found.[11] In all these high latitudes, the variation still continues nearly the same.

On the west side of America, in the same parallel of latitude as Davis' straits, Cape Farewell, &c. we perceive the variation assuming another character, and seldom exceeding half the quantity found at the above-mentioned places.

In 1786, in Lat. 53° north, Long. 145° 20′ west from Paris, the variation was from 23° to 24° east. In the same year, in Lat. 58½° north, Long. 138° west, it was 25° east; and in Port des Francois, in Lat. 58° 37′ north, Long. 137° 30′ west, the variation, as ascertained by the *meridian line*, amounted to 27° east.[12] In 1793, in Lat. 53° north, Long 231° east, (129° west,) the variation was only 20° 41′ east. In 1794, in Lat. 61° 17′ north, Long. 210° 53′ east, 29° 30′ of easterly variation was found; the *greatest* quantity Vancouver observed whilst on that coast.[13]

But of all the places on the globe with which we are acquainted, none exhibit such wonderful phenomena in the variation as the coasts of China, Corea, Tartary, Japan, and Kamtschatka northward.

In 1787, from Macao to Lat. 41° north, Long. 136° east from Paris, the quantity of westerly variation never exceeded 2°; and from this last point to Lat. 51½° north, Long. 142½° east, where the variation was only 0° 53′ east, the quantity never exceeded 3°.[14]

In 1804, in Lat. 52° north, Long. 143° east from Paris, there was no variation; 16° farther to the east, and 4° to the south, 5° 20′ of westerly variation was observed;[15] and in 1779, in Lat. 69° 55′ north, Long. 195° 14′ east, (Bhering's straits,) 35° 37′ east variation was found.[16]

From observations made between 1700 and 1775, there appeared three places or points on the globe where the change in the variation was much *greater* than elsewhere. These were, *first*, in the middle of the Indian ocean, from 10° to 15° South Lat. and from 64° to 69° East Long. where the change was 11° and 11° 45′; *second*, in the Ethiopian sea, from 5° North to 20° or 25° South Lat. and from 10° to 15° or 20° East Long. the change in the variation was about 10°; and, *third*, at 50° North Lat. and between 17° East and 10° West Long. the change was nearly 11°. In these different places the variation has since continued to increase at nearly the same rate.

During the same interval, it was also ascertained that there were *four* places or points on the globe where the variation has undergone no change. These were, *first*, from the eastern point of Africa to the farthest of the Bermuda islands; *second*, the environs of the island of Madagascar, and part of Zanguebar; *third*, that part of the ocean which is to the south and south-east of the Sunda islands, between them and New Holland; and, *fourth*, in the same sea, about 4° South Lat. and 97° East Long. that is, in the middle of the space comprised between the western angle of New Holland and the southern point of Africa. In all these places the variation did not vary perceptibly during 56 years.[17] And it may be remarked, that investigations made since the above period have not shewn any change worthy of notice in its quantity at the above-mentioned places.

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[1] Dampier's Voyage, vol. i. p. 80.

[2] Wales' Astron. Tables to Cook's Voyage, p. 384.

[3] La Perouse, Voyage round the World, vol. ii. p. 292.

[4] Vancouver's Voyage round the World.

[5] Bouditch, Epitome of Navigation, p. 150.

[6] Humboldt, P. N. vol. ii. p. 118.

[7] Phipps' Voy. towards the North Pole. Philos. Trans. for 1757.

[8] Dampier's Voyage, vol. iv. p. 146.

[9] Sybille's Tables of Variation.

[10] Hutton's Math. and Philos. Dict. vol. ii. p. 636.

[11] Philos. Trans. for 1757.

[12] La Perouse, vol. ii. p. 282.

[13] Vancouver's Voyage round the World.

[14] La Perouse.

[15] Krusenstern's Voyage of Discovery.

[16] Cook's Third Voyage, vol. ii. p. 519.

[17] Hauy's Nat. Phil. vol. ii. p. 108, 109.

Some intelligent sea-officers are of opinion, that, in the western parts of the English channel, the westerly variation has begun to decline; whilst others assert, that the variation is still increasing in the channel, and as far westward as 15° West Long. in 51° North Lat.—at which place, they say, the variation amounts to 30° west. Neither of those opinions, however, can be relied on as correct, though each may have been deduced from observation. If the head of the ship is on the *east* point of the compass at the time of observation, from 20° to 23° of variation will be observed; but, on the other hand, if the ship's head is at *west* at the time of observation, the observed variation will amount to 30° or 33°.

Having thus briefly noticed the changes to which the *variation of the magnetic needle* is subjected, let us now consider whether the position of the *curves of no variation* is liable to similar changes.

The curves of no variation, or the lines separating the variation of an easterly from that of a westerly character, intersect the terrestrial and magnetic equators, and pass through a series of points in the southern and northern hemispheres, where the needle points to the true poles of the world. These points are not, however, on the same meridian, but form an irregular curve, inflected different ways; the laws of magnetism being accelerated or retarded by the local influence of continents and islands, forming different small systems of magnetic forces.

The curves of no variation can be pretty distinctly traced, both in the eastern and western hemispheres. In 1662, in the northern hemisphere, a curve of no variation, which had *east* variation on its *eastern* side, and *west* variation on its *western* side, moved from west to east during two centuries prior to 1662; the lines of east variation moving before it, whilst the lines of west variation followed it. This curve first passed the Azores, then the meridian of London, and, after a certain number of years, the meridian of Paris. But, in the southern hemisphere, there was another curve of no variation, which had *east* variation on its *western* side, and *west* variation on its *eastern* side, moving from east to west. This curve first passed Cape Agulhas, and then the Cape of Good Hope, the westerly variation following it, the same as in the northern hemisphere, but in a contrary direction.

From observations made since the above period, it would seem that the curve of no variation in the northern hemisphere, after passing the meridian of London and Paris, has been stopped in its progress eastward; whilst the curve of no variation in the southern hemisphere still continues its course northwestward.

The variation on the *east* side of the curve of no variation, which passed the meridian of Agulhas in 1600, and extended north and south to a high degree of latitude in both hemispheres, being westerly: and the variation on the *east* side of the curve of no variation, which passed the meridian of London in 1662, being easterly; it follows, that the curve which passed London could not reach beyond the 18th degree of east longitude, as the denomination of the variation was the same eastward of that meridian in 1600 that it now is, namely, westerly.

The exact point where the southern curve of no variation passed the northern curve, cannot be satisfactorily ascertained; but observations shew, that whilst the northern curve of no variation was passing through London eastward, the curve of no variation in the southern hemisphere passed westward, nearly in the same parallel of longitude.

In the year 1675, in the latitude of the Cape of Good Hope, and longitude 20° west, the variation was 10° 30′ east. In latitude 24° south, longitude 32° west, the variation was 10° 50′ east. In latitude 16° south, longitude 6° 30′ west, the variation was 0° 40′ east; and in latitude 34° south, and longitude 1° east, there was no variation.[1]

Dampier, who, in his voyage to the East Indies in 1669, appears to have paid very particular attention to the variation, informs us,[2] that from 6° of South Lat. and 25° of West Long. till the 37° of South Lat. was intersected by the meridian of Greenwich, the variation was of an easterly character, never exceeding 13°; but at this latter point the easterly variation had decreased to nothing, and, changing its name, became westerly. From hence the westerly variation continued to increase till 47° of East Long. and 25° of South Lat. where it appears to have attained its maximum, about 25° or 26° west; and from this point the variation gradually diminished, till it again assumed another denomination in 10° South Lat. and 125° East Long. From this last point to as far north of the equator (10°) the variation appears to have been, as it still is, influenced by local attractions,—the quantity always small, sometimes east, and sometimes west.

Captain Cook, in 1772, in latitude 6° south, longitude 16° west, found 9° 30′ westerly variation; and in latitude 24° 40′ south, longitude 23° 51′ west, only 0° 39′ west variation. From this point the westerly variation gradually increased as the southern latitude and eastern longitude augmented till 96° of East Long. and 60° 49′ South Lat., when it had attained its maximum, 43° 45′ west.[3] From this last point eastward the variation rapidly diminished, and changed its denomination in latitude 58° 53′ south, longitude 143° 30′ east.[4]

But as the route of Admiral D'Entrecasteaux, in 1791, nearly coincides with Dampier's in 1669, the change in the position of the curve of no variation during that interval, will be best illustrated by a comparison of the respective observations.

M. D'Entrecasteaux, in his voyage in search of the unfortunate La Perouse, found the variation in latitude 6° south, longitude 25° west, 7° 15′ west, and in 25° south latitude, and 25° west longitude, only 1° 56′ west. From this last point the variation again increased as the west longitude diminished, till in the meridian of Greenwich, intersected by 33° of south latitude, the variation was found to be 15° west. The variation attained its maximum, 30° 48′ 9″, in latitude 34° 52′ south, longitude 38° 14′ 18″ east from Paris; and from this point, till 133° east longitude, and 44° south latitude, the variation continued westerly: but it there changed its name, and became easterly.

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[1] Hutton's Math. and Phil. Dict. vol. ii. p. 636.

[2] Vol. iii. p. 70—72.

[3] This is the greatest variation ever observed in the southern hemisphere.

[4] Wales' Astron. Obs. pp. 369, 370.

As D'Entrecasteaux, in 25° south latitude, and 25° west longitude from Paris, or 22° 40′ from Greenwich, found the variation only 1° 56′ west, it is probable that, had he gone 2° or 3° further west, he would have cut the curve of no variation.[1]

The space between the two curves observed by Dampier in 1669, reached from the meridian of Greenwich to 130° East Long. The distance between them, according to D'Entrecasteaux in 1791, must be 155°, Dampier having cut the curve in 0° 0′ Long.; the other in 25° West Long. The curve of no variation must, therefore, have advanced westward annually about 16′ in the parallel of 34° South Lat. to have shifted its place 25° in 92 years, and, at an yearly rate of 14′,8″, from the time it passed Cape Agulhas in 1600 to 1791. This curve is now ascertained to extend across the magnetic and terrestrial equators to a point in Lat. 37° 27′ north, Long. 70° 44′ west; but we shall notice this more fully hereafter.

Dampier, as already observed, found the curve of no variation in Lat. 10° south, Long. 125° east; and Captain Cook found it in Lat. 58° 53′ south, Long. 143° 30′ east. La Perouse cut it in Lat. 20° 48′ north, Long. 129° 8′ east; again in Lat. 40° 20′ north, Long. 130° 20′ east; and again in Lat. 51° 29′ north, Long. 142° 26′ east.[2] D'Entrecasteaux in 1791, cut it in Lat. 38° 14′ 18″ south, Long. 133° east; and four months afterwards, in 2° 28′ 38″ south, Long 129° 15′ east. Flinders found it in Lat. 32° south, Long. 132½° east. The Russian navigator, Krusenstern, in his voyage of discovery, cut it in Lat. 31° north, Long. 144° east; and he also found the same curve extended to a point in Lat. 52° north, Long. 143° east.

From these facts it follows, that a curve of no variation, bending westward, extends from the highest degree of southern Lat. in about 144° East Long. to Lat. 52° north in the same parallel: It intersects the equator in 130° East Long.

It is necessary to recollect, that the magnetic needle, influenced by local attractions in the great Asian Archipelago, frequently indicates variations of different denominations; but this circumstance nowise affects the general conclusions."

There is an equal number of facts to illustrate the variation eastward from the points just specified; but it is not necessary to bring them forward, as no doubt can be entertained in regard to the doctrine which they are meant to establish. After detailing a variety of positions and localities, Mr Bain remarks that:

"These different distances point out, under different parallels of latitude, the direction which the curve of no variation at present assumes; and we may perhaps conclude, that the variation of the magnetic needle is caused by two separate and distinct systems of magnetic forces; the one producing a westerly variation in the northern hemisphere, over a space of 200° 44′; and in the southern hemisphere, in the same parallel of latitude, of 143° 10′; and the other, an easterly variation in the northern hemisphere, over a space of 159° 16 ; and in the southern of 216° 50′.[3]

"From these facts, it would seem that the north end of the curve which passed Cape Agulhas in 1600 north-westward, was, in 1804, found to extend from 60° South Lat. in 13° 10′ West Long. to 37° 27′ North Lat. and 70° 40′ West Long.; intersecting the 13th degree of North, 21st, 30th, and 35th degree of South Lat.: hence the average rate of its movement has been nearly 26½′ annually; but it is extremely probable that the south end of this curve has, during the same period, remained stationary; and this difference in the movement of the two extremes of the curve of no variation in the southern hemisphere, may perhaps point out to us the reason why the quantity of variation should have continued the same off Cape Horn during 133 years, whilst at the Cape of Good Hope, Paris, and London, it should have increased 25° or 27° in the same period.

"The curve of no variation which passed through London eastward about the same time the curve in the southern hemisphere passed the meridian of Greenwich westward, appears to have been lost among the smaller magnetic powers at present found in the continent of Europe and Asia.

"The view which we have given of this perplexing subject, deduced from actual observations, renders it obvious, that all attempts by *theory* to fix on charts the exact positions of curves of no variation, or lines of given variation, must (as they have hitherto been) prove abortive.[4]

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[1] Labillardiere's Voy. vol. ii. App. p. 4, 6, 8, 12.

[2] La Perouse, vol. ii. p. 224, 240, 250, 256.

[3] It is necessary, however, to bear in mind, that the greater part of the continent of Europe, Persia, China, Tartary, Kamtschatka, and the whole of the great Asian Archipelago, on the east; Barbadoes, Jamaica, and perhaps the whole of the Caribbean sea, on the west; form so many different small systems of magnetic forces, as to render it difficult to determine to which of the greater systems they belong.

[4] We owe the first variation chart, published in 1700, to the celebrated Dr Halley. Previous to this period, he had collected, and made, a multitude of observations on the variation of the needle in many parts of the world, and was enabled to draw, on a Mercator's Chart, lines shewing the variation of the compass in the places through which they passed. But as the deviation of the magnetic meridian from the true one was then, as now, subject to continual alteration, this chart was soon found useless.

However, in 1744, Mountain and Dobson published a new Variation Chart, adapted to that year; which being well received, they published a second adapted to 1756; and a third in the following year,—the last we know of.

Nicholson strongly recommends the employment of the variation as a means of finding the longitude at sea; but navigators are long since convinced of its inadequacy. Vancouver, speaking of this subject, says, "This very able seaman, Nicholson, still wedded to formerly adopted opinions, strongly recommends the variation of the compass as a means for ascertaining the longitude at sea; yet, had we been no better provided, we might have searched for the Cape of Good Hope, agreeable to his propositions, to little effect; for when we were in Lat. 35° 7′ south, with 20°

"There are, indeed, places in the world, such as Spitzbergen, Cape Horn, Chili, and Mexico, the great Asian Archipelago, coasts of Coromandel, Pegu, Brazil, &c. where the curve of no variation, and the variation itself, has not undergone any perceptible change since first observed; but we have good grounds for believing, that, at all the above mentioned places, the variations are regulated by incidental magnetic attractions, which are lost or merged in the two great powers already described, at a little distance from their respective spheres. In all other places of the globe, the variation is continually undergoing a regular and progressive change; but it is impossible accurately to determine when this change may stop, or to foresee what quantity our westerly variation may attain."

We purposely abstained from giving a long account of the different theories of Magnetism, in order that we might have room for some interesting views that have been lately brought to light, in respect to the connection between magnetism and electricity. For the greater part of these we are indebted to Mr Barlow, the ingenious author from whose work we have already made so ample an abstract.

ON THE RELATION OF THE MAGNETIC AND ELECTRIC FLUIDS.

It was for many years suspected that there existed a strong analogy, if not a complete identity, between the electric and magnetic fluids, and various attempts were made to establish such relation on satisfactory principles. It was known, for instance, that lightning destroyed and reversed the polarity of magnetized needles, and that it produced a magnetic power in pieces of steel which had not before any such action. Now lightning and electricity have been long known to be identical; consequently, electricity ought to produce similar effects to lightning on magnetic and simple steel bars; but the attempts which were made to discover a satisfactory proof of this action by means of the electric apparatus were not attended with success; at least all that was effected in this way amounted only to communicating the magnetic property to steel bars, but without the experimenter being able to predict in what directions the poles would lie, and therefore was little more than might be produced by a blow, by twisting, and various other means. It was indeed stated, that the magnetism was more fully developed when the shock was passed through the needle transversely, than when it passed lengthwise; but still no definite conclusions could be drawn from the experiments.

Philosophers having thus failed of tracing the analogy between the electric and magnetic fluids, by means of the electrical apparatus, had next recourse to the galvanic battery, which was known to possess electrical properties. Of these experiments, those of Ritter are the only ones of any importance. He stated that he had succeeded, by placing a Louis d'or in contact with the extremities of a galvanic circuit, in giving to it a positive and negative electric pole, which remained after it had been in contact with other metals; he also magnetised a gold needle by means of the galvanic battery, and seems to have had some obscure ideas of electric terrestrial poles at right angles to the magnetic poles. These experiments, however, were never much regarded, and the relation between the two fluids seemed still to remain doubtful.

Soon after the time that Ritter made his experiments, Professor Œrsted, of Copenhagen, published a work in which some hints are thrown out respecting the analogy between the electric, galvanic, and magnetic fluids; which were supposed to differ from each other only in their degree of tension. The galvanic fluid is there conceived to be more latent than the electric, and the magnetic still more so than the galvanic. The science, however, made no farther progress from this time (1807) till the year 1820, when the same learned Dane succeeded in establishing the reciprocal action of the galvanic and magnetic fluids upon each other by the most satisfactory experiments. These have been since repeated, and much extended by Ampere, Biot, Arago, in France; by Sir H. Davy, Professor Cummings, and Mr Faraday, in England; and have thus led to the establishment of a new branch of philosophy, designated electro-magnetism, of which it is proposed to give a concise view in the following paragraphs.

Œrsted's Experiments.—As these leading experiments are very concisely and clearly stated by the author, we shall give them in his own words.

The galvanic machine being charged, and its poles connected by a wire of any metal (which may be called the *conductor* or *uniting wire*,) the following effects will be noticed:

Let the straight part of this wire be placed horizontally above the magnetic needle, properly suspended, and parallel to it. If necessary, the uniting wire is bent so as to assume a proper position for the experiment. Things being in this state, the needle will be moved, and the end of it next the negative side of the battery will go westward.

"If the distance of the uniting wire does not exceed three quarters of an inch from the needle, the declination of the needle makes an angle of about 45°. If the distance is increased, the angle diminishes

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16′ west variation, we had only reached the Long. of 6° 30′ west; and again, when in Lat. 35° 22′ south, with 22° 7′ west variation, we had only advanced to the Long. of 11° 25′, instead of being, according to Mr Nicholson's hypothesis, in the first instance, nearly under the meridian of the Cape of Good Hope, and in the second under that of Cape Agulhas; and it was not until we had near 26° of west variation, that we approached the meridian of the Cape of Good Hope. The observations for the variation were made with the greatest care and attention; and though generally considered as correct, they differed from one to three, and sometimes to four degrees; not only when made by different compasses, placed in different situations on board, and the ship on different *tacks*, but by the same compass, in the same situation, and at moderate intervals of time; the difference in the results of such observations, at the same time, not preserving the least degree of uniformity. Hence the assertion amounts nearly to an absurdity which states, 'that with 20° to 20° 10′, or 20° 30′ westerly variation, you will be certain' of such and such longitudes; and it is greatly to be feared, that navigators who rely on such means for ascertaining their situation in the ocean, will render themselves liable to errors that may be attended with the most fatal consequences."—VANCOUVER'S *Voyage round the World*, p. 15.

proportionally. The declination likewise varies with the power of the battery.

The uniting wire may change its place, either towards the east or west, provided it continue parallel to the needle, without any other change of the effect than in respect to its quantity. Hence the effect cannot be ascribed to attraction; for the same pole of the magnetic needle which approaches the uniting wire, while placed on its east side, ought to recede from it when on the west side, if these declinations depended on attraction and repulsions. The uniting conductor may consist of several wires or metallic ribbons connected together. The nature of the metal does not alter the effect, but merely the quantity. Wires of platinum, gold, silver, brass, iron, ribbons of lead and tin, a mass of mercury, were employed with equal success. The conductor does not lose its effect though interrupted by water, unless the interruption amounts to several inches in length.

The effect of the uniting wire passes to the needle through glass, metals, wood, water, resin, stoneware, stones; for it is not taken away by interposing plates of glass, metal, or wood. Even glass, metal, and wood, interposed at once, do not destroy, and indeed scarcely diminish the effect. The disc of the electrophorus, plates of porphyry, a stoneware vessel, even filled with water, were interposed with the same result. We found the effects unchanged when the needle was included in a brass box filled with water. It is needless to observe, that the transmission of effects through all these matters has never before been observed in electricity and galvanism. If the uniting wire be placed in a horizontal plane under the magnetic needle, all the effects are the same as when it is above the needle, only they are in opposite directions; for the pole of the magnetic needle next the negative end of the battery declines to the east.

That these facts may be more easily retained, we may use this formula,—the pole above which the negative electricity enters is turned to the *west*; the one under which it enters is turned to the *east*.

If the uniting wire be so turned in a horizontal plane as to form a gradually increasing angle with the magnetic meridian, the declination of the needle *increases*, if the motion of the wire be towards the plane of the disturbed needle; but it diminishes if the wire moves farther from that plane.

When the uniting wire is situated in the same horizontal plane in which the needle moves, and parallel to it, no declination is produced either to the east or west; but an *inclination* takes place, so that the pole next which the negative electricity enters the wire is *depressed* when the wire is situated on the west side, and elevated when situated on the east side.

If the uniting wire be placed perpendicularly to the plane of the magnetic meridian, whether above or below it, the needle remains at rest, unless it be very near the pole; in that case the pole is *elevated* when the entrance is from the *west* side of the wire, and depressed when from the east side.

When the uniting wire is placed perpendicularly opposite to the pole of the magnetic needle, and the upper extremity of the wire receives the negative electricity, the pole is moved towards the east; but when the wire is opposite to a point between the pole and the middle of the needle, the pole is moved towards the west. When the upper end of the wire receives positive electricity, the phenomena are reversed.

If the uniting wire be bent so as to form two legs parallel to each other, it repels or attracts the magnetic poles according to the different conditions of the case. Suppose the wire placed opposite to either pole of the needle, so that the plane of the parallel legs is perpendicular to the magnetic meridian, and let the eastern leg be united with the negative end, the western leg with the positive end of the battery, and in that case the nearest pole will be repelled either to the east or west, according to the position of the plane of the leg. The eastmost leg being united with the positive, and westward with the negative side of the battery, the nearest pole will be attracted. When the plane of the legs is placed perpendicular to the place between the pole and the middle of the needle, the same effects recur, but reversed.

A brass needle, suspended like a magnetic needle, is not moved by the effect of the uniting wire. Needles of glass, and of gum lac, remain likewise quiescent.

These facts having laid the foundation of the present interesting science of electro-magnetism, we have thought it best to give the statement in the author's own words; but in what follows, it will be necessary to be more concise.

The experiments of Mr Œrsted were no sooner promulgated than they were repeated and considerably extended by M. M. Ampere, Arago, and Biot; by Sir H. Davy, Mr Faraday, and Professor Commings, as well as by several celebrated German philosophers; and many curious and interesting facts and phenomena were thus elicited.

M. Ampere, for instance, discovered that not only is there a reciprocal action between the galvanic wire and the magnetic needle, but that two such wires act upon each other, by attraction, when they both proceed from the same extremity of the battery, and by repulsion when they proceed from opposite extremities; that is, two conducting wires, free to move, being placed parallel to each other, and the corresponding extremities proceeding to the like poles of two different galvanic machines, the wires will be attracted to each other; but if the corresponding extremities of the wire proceed from contrary poles of the batteries, then the wires will indicate a mutual repulsion between them.

Again, it was shown by M. Arago that the connecting wire of a galvanic battery had an obvious action upon iron filings, and that it would hold them suspended like an artificial magnet, but that they fell the moment the contact with the battery was broken. The same thing was discovered by Sir H. Davy, who also showed that the filings on the opposite sides of two parallel wires attracted each other, and that those on the same sides repelled.

The latter experiments naturally led to an attempt to magnetize steel wires by the galvanic battery, in which the first successful attempt was made by Sir H. Davy, although it was effected at nearly the same time by M. Arago. In the first instance the needle was simply laid transverse of the single wire, and the operation required a certain time; but M. Arago afterwards made use of a spiral wire, and was thus enabled to produce the maximum effect almost instantaneously. Sir H. Davy also succeeded in magnetizing steel needles with the electrical battery at very considerable distances, and thus demonstrated that the magnetic power was not peculiar to the galvanic apparatus.

The next question was, since there is so obvious a connection between the freely suspended galvanic wire and a magnet, has the former a directive quality from the influence of the terrestrial magnetism?

This led M. Ampere to the construction of a simple but very beautiful and most ingenious apparatus, and by which he proved that, if a part of the galvanic wire, bent into the form of a rectangle nearly shut, and free to move, be left to the action of the terrestrial magnetism, it will adjust its plane to one perpendicular to the magnetic meridian, and that by giving to a similarly formed wire a freedom of motion on a horizontal axis, it will conform itself to that plane which, in a former section, has been called the plane of no attraction; that is, the plane of the wire will, in all cases, have a tendency to place itself at right angles with the plane of the magnetic meridian, and to the line of direction of the dipping needle.

At this stage of the enquiry, Mr Faraday, of the Royal institution, commenced his enquiries. He proved that the action which had hitherto been noticed between the magnetic and the galvanic wire, was neither attraction nor repulsion, but was of such a nature as to give to the magnetic needle a tendency to revolve about the wire, and he at length succeeded in producing this rotation; viz. he was enabled by a very simple apparatus, which we have not room to describe at length, to cause either pole of a magnet to revolve about a fixed galvanic wire, and conversely, by fixing the magnet, he caused the wire to revolve about the former, and, by the same apparatus also, the wire and magnet being both free, may be made to revolve about each other; and he subsequently was enabled to produce a rotation of the wire by the mere influence of the terrestrial magnetism upon it. These beautiful experiments threw an entirely new light upon the science of electro-magnetism.

M. Ampere having been informed of Mr Faraday's experiments, succeeded in causing the magnet to revolve on its own axis, by introducing it as a part of the galvanic circuit; an experiment attempted by Mr Faraday, but which he had not been able to perform: And Sir H. Davy, by his experiments on the mercurial vortices, proved also the rotation of the wire on its axis, which is effected in another manner in one of Mr Barlow's experiments.

All the experiments that have been made on the subject of electro-magnetism, since the first discovery of that power by M. Œrsted, seem to indicate a strong affinity, although not a complete identity, between the simply magnetic and the electro-magnetic fluids; or, if the identity be admitted, still a certain difference must be conceived to have place in the modes of action.

"My first object," says Mr B. "was to repeat very carefully all the experiments of Mr Œrsted, M. M. Ampere, and Arago, of Sir H. Davy and Mr Faraday, with some others suggested by the results thus obtained; and having attentively considered all the peculiarities of action thus developed, I was led to consider that all the apparently anomalous effects produced on a magnetized needle by the action of a galvanic wire, might be explained by the admission of one simple principle, viz. that every particle of the galvanic fluid in the conducting wire acts on every particle of the magnetic fluid in a magnetized needle, with a force varying inversely as the square of the distance; but that the action of the particles of the fluid in the wire is neither to attract nor to repel either poles of a magnetic particle, but a tangential force which has a tendency to place the poles of either fluids at right angles to those of the other; whereby a magnetic particle, supposing it under the influence of the wire only, would always place itself at right angles to the line let fall from it perpendicular to the wire, and to the direction of the wire itself at that point."

There is very little doubt, we think, that the progress of discovery in natural philosophy, and the greater perfection of instruments to which the arts are every day making rapid advances, will enable the careful student in this department of science to identify the action of magnetism with that of electricity. But we will not anticipate the maturity of knowledge by vain conjectures; preferring rather to conclude this article with a few observations on

MAGNETICAL INSTRUMENTS.

The horizontal needle.—This instrument consists of a uniform steel bar, of almost any shape and any length, from an inch or less to a foot or more. It is sometimes made broader at its centre than any other part; and is there tapped with an interior screw to receive the exterior screw turned upon a brass cap, furnished with an agate, on which the needle is balanced upon a steel point.

For the purpose of observation, the needle, prepared as above, is placed upon a point in the centre of a brass or wooden box furnished with a graduated limb, and sometimes the ends of the needle are made to carry a Vernier scale, in order to bring down the reading to minutes or lower. The box, which may be round, square, or octangular, is, moreover, furnished with two straight edges of brass, or index marks, to set to any proposed line, and sometimes with sights, the top being covered with glass to prevent the needle from being disturbed by the action of the air. The reader will probably take more interest in an instrument which is much better known, and familiar to the recollection of every one, under the designation of

The sea, or steering compass.—This simple piece of magnetical apparatus differs very little from that which has just been described, except in the form of the bowl in which the card is suspended. To fit this instrument for its particular use, the card is supported upon a pin fixed in a heavy brass box or bowl, the bowl itself being hung in gimbals in a wooden square box, or, when at sea, fitted to the ship's binnacle. On that part of the compass-bowl which is fixed directly forward in the vessel, on the inside, is a clear black line, called the *lubber-line,* and is that which the steersman uses to keep his required course; that is, he must always keep the point of the card which indicates his course directly coinciding with the lubber-line.

There are various improved instruments of this description of modern invention, the greater part of which present peculiar advantages to recommend them to the attention of the navigator. Of these it will be sufficient to mention, Gilbert's steering compass; M'Culloch's patent compass; Alexander's improved compass; Preston's compass; Pope's compass; and Jenning's patent insulating compass. This last differs very little from the common compass, except that the brass bowl is made double, so as to leave a space between the outside and inside surfaces of about a quarter or half an inch, which is filled with pure iron dust or filings; the needle is therefore surrounded with iron, and was thought to be thereby insulated from the action of the guns and other iron of the ship. The hopes, however, which were founded upon this construction have proved erroneous, and the instrument is very little used.

The azimuth compass.—The principal difference between this and the common steering-compass consists in its being fitted with sights and hung in detached gimbals, which turn on a vertical pin in the box. The pin is sometimes fixed below the box, and, being inserted in a proper support, the instrument may be directed to any object to determine its bearing or azimuth, and hence the name by which it is distinguished.

Variation compass.—This instrument being intended for ascertaining small changes, annual or diurnal, in the declination of the magnetic needle, is commonly more limited in its arc of vibration, and has a needle somewhat longer than those which are used for more common purposes. It is also furnished with conveniencies for reading more closely than the common needle; otherwise any needle so mounted and furnished as to be very sensible and capable of being read off to minute divisions, might be used as a variation compass. In general, however, needles designed for this purpose are constructed in a particular manner, having only a very small part of the circle graduated, and having the means of distinguishing small changes better fitted to the eye than they generally are in common horizontal needles. The place in which they are fixed, requires also to be particularly firm and steady, and in short every precaution is necessary in order to avoid small irregularities.

The most complete instrument of this kind, with which we are acquainted, is that which was invented by Colonel Beaufoy, by means of which he made a series of very valuable magnetical observations, in the years from 1813 to 1821; during which period the needle attained its maximum of westerly variation in the meridian of London. For a full account of these observations, as well as for a description of the variation compass, we beg leave to refer the reader to the Annals of Philosophy, from August 1813 to the last of the years specified above.

The dipping needle.—It has been already mentioned that when a uniform steel bar is first correctly suspended at its centre of gravity and then magnetized, it will take a certain inclination; one extremity dipping below the horizon, and the other arising above it. It has also been observed that this curious fact was first noticed in London by Norman, in 1576, and that at this period the inclination in the neighbourhood of the metropolis was more than 71°. It was many years after this date, however, before the inclination was known to have a variation, but the fact has since been well ascertained, and various instruments, denominated *dipping needles,* have been constructed with a view of ascertaining the amount of the dip in different places at the same time, or in the same place at different periods; but it was only towards the latter end of the last century that sufficient accuracy could be carried into their construction, to render them fully competent to the delicate task which they were intended to perform. At present, even the most perfect of these instruments are susceptible of essential improvement, for which we must look to the improving condition of the arts, and the great talents and unwearied patience of the numerous enquirers whose attention continues to be directed to this interesting subject.

The best dipping needles, we believe, are those which have been contructed on the principles followed by the Gilberts and M. Mayer; but as these cannot be intelligibly described without a reference to a variety of figures, we must rest satisfied with naming the Philosophical Transactions, for the two or three last years, as the source of much valuable information, both in regard to these instruments and the method of using them.

The dip of the magnetic needle at present in the vicinity of London is somewhat less than it was when first ascertained in 1576; being, according to a number of observations made by Captain Sabine, about 70.03, and, agreeably to the result of other observations, not more than 69° 58′. The variation, too, as has been already remarked, has begun to decrease; the magnetic meridian having commenced a retrogressive motion towards the true north: And these are the principal facts connected with the modern history of Magnetism.

MAGNITUDE denotes what is made up of parts locally extended, or what has several dimensions; as a line, surface, solid. The apparent magnitude of a body is ascertained by the visual angle, formed by rays drawn from its extremes to the centre of the eye.

MAGNOLIA, Laurel-leaved Tulip-tree, a genus of plants belonging to the Polygynia class.

MAGPIE. See Ornithology.

MAHIE, a sour paste, prepared, by fermentation, from the bread-fruit, is so named by the natives of Otaheite, who use it as an article of food. For an account of the bread-fruit tree, see Botany.

MAHOGANY, Swietenia Mahogani. See Botany.

MAHOMET, or Mohammed, the founder of the Mahometan religion, was born of illustrious parents at Mecca, in the year 569. In consequence of the death of his parents, he was at an early age taken under the protection of Abu-Taleb, his uncle, who taught him the arts of war and commerce. At the age of 25, he entered the service of a noble and rich widow, who so highly estimated his merits that she married him. After a period of fifteen years spent in the regular exercise of devotion, and the practice of charity, the agreeable, and perhaps fanciful sense of his own virtues, impressed Mahomet with the idea that he was an inspired prophet. A cave in Mount Kara was his favourite resort for religious exercises; and being there with his family in 609, he assured them that the angel Gabriel had stood before him, and had given him a commission during the night, as the apostle of God, to restore to its original purity the true religion of Abraham and Ismael. His wife Kadijah, his cousin Ali, and his slave Zad, were his first converts; and thus he commenced his mission, in the 40th year of his age. The intreaties of Abu-Taleb proved ineffectual to dissuade Mahomet and his son from the scheme in which they had embarked; nor were they to be intimidated by discouragement or opposition. In the absence of miracles, the prophet appealed to the purity of his doctrine; and by the relation of marvellous stories, he effectually influenced the minds of the vulgar. After the decease of the prince or pontiff of Mecca, Abu-Taleb, the follower of Mahomet, as well as himself, were forced to flee from the persecution of the Koriesh tribe. The impostor, however, with his friend, Abu-Beker, at length found his way to Koba, in the vicinity of Medina, where he was hailed with enthusiasm by 500 of the most opulent inhabitants; and being thus attended, he, with wonderful success, assumed not only the priestly but the regal power. Gratified with present indulgence, and buoyed with the promise and assurance of endless felicity in a future state to every one who should fall in battle, his followers were animated with energy and courage; and the work of conversion prospered by the appalling influence of the sword. Mahomet was affected with a bilious disorder in the 63d year of his age, of which he died in the year 632. See Arabia and Koran; Prideau's and Gagner's *Life of Mahomet*; and Mill's *History of Mahommedanism.*

MAHRATTA. See Hindoostan.

MAIDEN, an apparatus for decapitating criminals, formerly used in Scotland and the north of England, and which somewhat resembled the guillotine.

MAIDENHEAD, a market town of Berkshire in England, situated on the Thames, which is crossed by an excellent bridge; is handsomely built, and consists of one spacious street. The trade in malt, meal, and timber, is considerable, and a corn-market is held on Wednesdays. The population in 1811 was nearly 800.

MAIDSTONE, the capital of the county of Kent. See Kent.

MAJESTY, a title of kings and emperors. See Heraldry.

MAIL, Maille, originally denoted the meshes in net-work, but was afterwards applied to the habergeon, a kind of defensive armour composed of small iron rings linked together. Chain-mail consisted of iron rings, so united as to form a sort of net-work, with circular meshes; whereas plate-mail was composed of pieces of metal, applied one to another like the scales of a fish, and fixed to a linen or leathern jacket.

MAIL, the leathern bag in which letters are forwarded by post. Previous to 1784, mails were conveyed by a cart and horse, and by boys on horseback; but the frequent occurrence of robberies led government to adopt a number of coaches, properly constructed, for the transmission of the various bags or packets of letters to their several destinations. The mail-coaches leave London at eight o'clock in the evening, and reach particular post-towns at specific times. Each of them carries six passengers, and, with four horses, travels at the rate of eight, nine, and even ten miles an hour. The safety and expedition of these coaches render them highly advantageous to travellers; and their adoption, besides materially benefiting the revenue, operates essentially on all the interests of society.

MAIN, in sea language, is a term opposed to what is secondary or inferior; thus main-mast, main-wale, main-hatchway, are distinguished from the fore and mizen-masts, the channel-wales, and the fore and after-hatchways; likewise main-land applies in contradistinction to a peninsula or an island.

MAINE, a district of the United States of America, situated between 43° 4′, and 48° 12′ N. Lat. and between 64° 54′, and 70° 40′ W. Long., and bounded on the east by New Brunswick, on the north by Canada, on the west by the Piscataqua, and on the south by the Atlantic. The average length and breadth is 200 miles, with an area of 25,600,000 acres; and the counties, which are eight in number, are York, Cumberland, Kennebec, Somerset, Lincoln, Hancock, Washington, and Oxford. This district presents an uneven surface, but Agamenticus is the only considerable mountain. The chief rivers are the St John, the St Croix, the Scoodie, the Penobscot, the Kennebec, the Androscoggin, the Saco, and the Piscataqua; besides which the Umbagog, Moosehead, and Sebacook, are extensive lakes. The land is generally arable and fertile, and produces hops, wheat, barley, rye, oats, hemp, and flax, together with different fruits. Iron ore, and a stone which yields copperas and saltpetre are the principal minerals. This district contains seven academies, a college, with a library, and a great number of churches. The population in 1810 was 228,705. Coarse cloths and agricultural implements are manufactured here; and the exports consist of different sorts of timber, and of cod-fish and pickled salmon. The inhabitants are characterised as hospitable, brave, and industrious. Portland, Bath, Witcasset, and York, are the chief towns.

MAINE & LOIRE, a department of France; bounded on the north by the departments of Mayenne and Sarthe; on the east by Vienne; on the south by La Vendée; and on the west by the department of Lower Loire. It is about 26 leagues in length, and 21 in breadth; affords excellent pasture for cattle, and produces corn, hemp, flax, wine, and fruits. The forests are extensive; and near Anjou, which is the capital, good slates are easily procured. The population in 1803 was 376,033.

MAINE, formerly a province of France, but now constituting the department of Mayenne and Sarte; is bounded on the east by Orleanois, on the north by Normandy, on the south by Touraine and Anjou, and on the west by Bretagne.

MAINLAND, the largest of the Shetland isles, is 60 miles in length, and in some places 16 miles in breadth, and presents a bleak, rugged, and mountainous aspect. Numerous promontories jut out, and give a bold, irregular appearance to the coast, while the various bays that indent it afford excellent havens for the shipping. The breed of cattle, horses, and sheep is diminutive in size; but the horses, called Shetland ponies, are strong. Eagles, ravens, and falcons frequent the elevated cliffs; game is abundant on the mountains; and in the caverns and bays are found seals and otters, swans, scarfs, geese, and other birds. Abundance of fish are caught, and at certain times remarkable shoals of herrings frequent the coast. The island is said to contain a copper and an iron mine, which promise to be productive. The women knit worsted stockings, caps, and gloves, while the men are occupied with fishing. Lerwick is the capital.

MAINPRIZE, in law, the taking of a person into friendly custody rather than have him committed to prison—upon security of his due appearance at a time specified. The parties undertaking in this case are styled *mainpernors*, because they receive the person into their hands; and hence comes the word *mainpernable*, signifying the person who may thus be bailed. Mainpernors cannot imprison or surrender the individual before the day is assigned, as a man's bail can, but are bound for his forthcoming to answer all charges.

MAINTENANCE, in law, is an interference in a cause, to enable either party to depend or prosecute; and is an offence against public justice, as it prevents the remedial process of the law, and is productive of strife or oppression. The practice was condemned by the Roman law, as a species of *crimen falsi*. By common law, the punishment is fine and imprisonment; and, by statute 32 Henry VIII. c. 9. it is a forfeiture of L.10. Yet, a man may, out of compassion, assist his kinsman, servant, or poor neighbour.

MAINTENON, FRANCES D'AUBIGNE, a remarkable French lady, whose qualifications had the fascinating effect to elevate her from indigence to the high dignity of consort to Louis XIV. She was born in a prison, where her father was under confinement for a political misdemeanour; but she was fortunately privileged by her mother with an accomplished education. After the decease of her parents, she, to avoid dependence, married the aged and infirm Abbê Scarron, who enjoyed for life a pension from the court. But, in consequence of his death, which happened in 1660, she was reduced to destitute circumstances. In this dilemma, she, by advice, presented petitions to the king, praying for a continuance of the pension with which her late husband had been favoured; and, after considerable delay, she was indulged with a good settlement, through the obliging intercession of Madame de Montespan, the favourite of Louis. This generous lady afterwards entrusted her with the care of the children she had by his Majesty, which circumstance brought her gradually into notice; and the king, though at first prepossessed against her, became delighted with her superior accomplishments, and eventually bestowed upon her the lands of Maintenon, with the title of Madame de Maintenon. Having thus become an acknowledged favourite with the king, she was privately married to him in 1686, and in this exalted situation, which, indeed, she did not conceive a happy one, her conduct was altogether exemplary. By her request, Louis founded a religious community, for the tuition of L.300 young ladies, at St Cyr, to which she herself retired after his decease, with an annual pension of 80,000 livres, and the remainder of her days were spent in devotion. The character of this amiable woman is best delineated in her own letters, which were published after her death, and have been translated into English.

MAJOR, a title of distinction belonging to military officers of different ranks. The *major-general* is next to the lieutenant-general, and his duty is to receive and distribute orders to the brigade-majors, and assist in regulating guards, convoys, and detachments. He must be particularly acquainted with the strength of each regiment, and possess a proper list of the field-officers. An aid-de-camp, a serjeant, and a guard, consisting of fifteen men, are allowed him. The *major of a regiment* is next to the lieutenant-colonel, and he conveys all orders, sees the regiment exercised, and rallies it, when necessary, in an action. As an instructor of others, he requires to possess considerable qualifications. He must keep an accurate detail of the regiment in all respects. A *major of artillery* is likewise next to the lieutenant-colonel; and as he must keep a full detail of what concerns the corps, the non-commissioned officers, who are all subordinate to him, are bound to communicate to him what they know respecting the duty or wants of the soldiers. The orders he daily receives from the brigade-major, he communicates with the parole to his superiors, and dictates to the adjutant. The *brigade-major* is only required in camp, and his duty is to obtain daily orders from the adjutant-general, and deliver them to the major or adjutants of the regiments composing the brigade; and also to assist in regulating the number of officers and men which each shall furnish for duty. A *major of* *engineers*, or subdirector, is a person qualified to conduct military architecture, fortifications, gunnery, and mining. A *town-major* is next to the deputy-governor; he must know fortification, and take charge of the guards, rounds, patroles, and centinels. A *serjeant-major* is a non-commissioned officer, subordinate to the adjutant as he is to the major.

MAJOR, the first proposition of a regular logical *syllogism*.

MAJOR and MINOR, in music, are terms applied to concords differing from each other by a semitone.

MAJOR, in law, an individual of proper age to conduct his own affairs. By the law of England, a man is of age at twenty-one; but, by the civil law, he is not of age till twenty-five.

MAJORCA, the largest of the Iberian or Balearic islands in the Mediterranean, situated about 40 leagues from the coast of Spain. It is about 50 leagues in circumference, and nearly encompassed by a chain of mountains. The climate and soil are very favourable, and grain, flax, olives, figs, oranges, melons, and various other fruits, are abundantly produced. The mountains afford an excellent supply of timber for carpentry and ship-building; wild olives thrive spontaneously on the declivities of the hills, and throughout the island there is great variety of curious plants. Several excellent marble and stone quarries are wrought; and in some districts slate, chalk-stone, plaster, and stalactites are likewise to be obtained. The breed of sheep is very superior, and mules, pigs, poultry, and game are also numerous. Manufactures of linen and woollen stuffs, and likewise of silk, are carried on; a coral fishery, a glass-house, and paper manufactory are established. The commercial intercourse is very considerable, and among the principal exports are wines, brandy, oils, cheese, and fruits; in return for which, grain, salt provisions, sugar, coffee, rice, snuffs, drugs, hardware, hosiery, powder, shot, &c. are imported.

The natives in their manners are similar to the Spaniards, and the Castilian language is generally spoken throughout the island. The females are uniform and elegant in their dress, are fond of ornaments, and have an engaging appearance. They wear a head-dress, consisting of a double handkerchief, and called a rebozello, which is so tied under the chin as to fall considerably down the back. The dress of the peasants is a cap, jacket, and large breeches, together with a frock. The Catholic religion prevails, and the people are remarkable for loyalty. The population of the whole island is said to amount to 136,000.

This island contains two cities, besides several towns, and many extensive villages. *Majorca*, the capital, is finely situated on the south-west of the island, with a good harbour, and is well fortified with walls and bastions. It is regularly built in the Moorish style of architecture; the squares, the cathedral, the palace, and other edifices are very attractive, and the Balearic clock is a singular curiosity. This city contains several hospitals and charitable institutions, and the population is estimated at 33,000. It is the see of a bishop. *Alcudia* stands on a peninsula north-east from the island, and contains about 1000 inhabitants.

MAJOR-DOMO, an Italian term of frequent use, and denoting a steward or master of the household.

MAIRE, Straits of Le, a passage between Staten island and Terra del Fuego to Cape Horn, and which was discovered in 1616 by the Dutch navigator Le Maire. It has been preferred to the Straits of Magellan, as more safe; but it is now less frequented.

MALABAR. See Hindoostan.

MALACCA, or Malaya, a considerable peninsula of Asia, situated westward from the gulf of Siam; is 700 miles in length, and about 150 in breadth; and is supposed to be the *Ophir* of Scripture. This country, which might be vastly improved by the hand of cultivation, is well watered by numerous mountain streams; many of the finest vegetable productions grow spontaneously; and the forests in the interior are very extensive. The northern parts abound with cattle; and elephants, wild boars, tygers, monkeys, and various birds inhabit the inland tracts. Some of the rivers contain gold dust; but rice, odoriferous woods, gums, spices, timber, and elephants teeth, are the chief productions. Malacca consists of different petty states, which are Rumbo, Salangor, Perak, and Queda on the west, and Ligor, Patani, Trangano, Packang, and Johor on the east. The principal islands are Prince of Wales island, Pulo-Penang, Sincapoor, Botany, and Bintang. The government is of a feudal nature. The rajah, who has the title of sultan, is at the head of affairs, and subordinate to him in some degree are the dattoos, or nobles, with their vassals. Comparatively, little is accurately known of the internal situation of Malacca. The Siamese occupy the northern part of the island, the Malays possess the sea coast, the inland parts to the northward are inhabited by the Patani people, and in the forests and mountains are savage tribes of Caffres. The free Malays are active and courageous; they make good sailors, are intrepid in the pursuit of plunder; and to their enemies, and also strangers, they are violently rapacious and deceitful. The religion consists chiefly of Mahomedanism.

Malacca, the chief town of the island, is agreeably situated on the coast, and was formerly well fortified. It possesses few attractions, being neither very spacious nor regular. The houses are of brick, and those of the humble classes are constructed of wood and thatched with leaves. A Portuguese church and an English school are established; and among the chief curiosities of the place is a Chinese burial ground, which occupies a considerable hill in the vicinity. Besides the Malay inhabitants, the Chinese in the town and suburbs are supposed to amount to 6000, and the Portuguese are also numerous. The principal manufactures are arms, cutlery, coarse cloth, and cordage. The trade is now removed to Prince of Wales island. The inhabitants are governed by the Dutch laws. The jurisdiction of the British government is maintained for 50 or 60 miles inland.

MALACHI, a canonical book of the Old Testament, written by the prophet of that name, who, according to ancient tradition, belonged to the tribe of Zebulon, and was born at Sapha after the Babylonish captivity.

MALAGA, a city of the province of Granada, in Spain, situated on the coast of the Mediterranean, contains several fine squares, and a grand cathedral. Manufactures of cards, silks, velvets, hosiery, and soap, are established here; the trade consists chiefly in figs, raisin, and wines. The inhabitants amount to about 40,000.

MALDEN, or MALDON, a borough town of Essex, seated on an eminence near the river Blackwater, which is navigable for vessels of moderate size to the town. It contains two parish churches, a free school and library, and a town hall, and range of convenient barracks. The trade is considerable, and the population amounts to nearly 3000. The custom of Borough-English, already described, prevails in this town. Malden was the first colony of the Romans in Britain, and the seat of some of the old British kings. It sends two members to Parliament.

MALDIVES, or MALDIVIAN ISLANDS. See HINDOOSTAN.

MALEBRANCHE, NICHOLAS, a remarkable French philosopher, was born at Paris in 1638, and having acquired the rudiments of education from a private tutor, he then prosecuted his studies at the college of La Marche, and at the Sorbonne, and in the 22d year of his age assumed the monastic habit. He afterwards, however, resigned the study of theology for that of metaphysics; and devoting himself entirely to the Cartesian system, he, in 1673, published his much celebrated work, *De la Recherche de la Verite*, in three volumes, 12mo. He likewise wrote several other treatises of the same tendency; and he contributed several papers to the Memoirs of the Academy of Sciences. Though of a delicate constitution, he lived to the age of 72 years, and died in 1717.

Malebranche was extremely agreeable in his manners, of a very contemplative turn, and particularly ardent in the pursuit of truth. He was singularly happy in the expression of his ideas; and Mr Locke speaks of him as an acute and ingenious writer.

MALESHERBES, CHRISTIAN WILLIAM DE LAMOIGNON DE, son of William de Lamoignon, chancellor of France, born at Paris in 1721; was educated at the Jesuit's college, and afterwards became a student of law. Having succeeded his father as president of the Court of Aids in 1750, the superintendance of the press came also under his cognizance for a time; and he essentially advanced freedom of speculation, and the interests of literature. But in consequence of his intrepid conduct in opposing arbitrary power, he was banished to his country seat by a *lettre de cachet*, and the court in which he precided was abolished. He, however, resumed his public functions on the accession of Louis XVI. before whom he, on that occasion, delivered a memoir on the state of the kingdom, which ingratiated him so much with the king that, in 1775, he was chosen minister of state. During the short period of his administration, he was indefatigable in his exertions for the general good; but failing in his magnanimous exertions in behalf of the Protestants, he resigned his office in 1776. Malesherbes now spent some years in travelling through France, Switzerland, and Holland, and on his return he was recalled to the king's council, in 1786, in consideration of his talents and upright character; but his political sentiments not corresponding with those of the other ministers, he prudently retired from the court. In 1790, he published his "Essay on the means of accelerating the progress of rural economy in France." This great man was warmly attached to Louis XVI. and anxiously solicited and obtained permission to act as one of the council of that unfortunate monarch when his trial was decreed by the national convention, and he was among the last who took leave of Louis previous to his execution. His noble defence of the king was the probable cause of himself and family being afterwards subjected to the barbarity of the convention. On the fatal day of his own execution he appeared perfectly serene, and pleasantly said, on his stumbling accidently against a stone, "a Roman would have thought this an unlucky omen, and walked back again." He suffered in the 73d year of his age, in April 1794. So sensible were the French of the worth and spotless integrity of this victim of accursed tyranny, that a bust of him was afterwards placed among those of the illustrious characters who have been an honour to their country.

MALIC ACID. See CHEMISTRY.

MALICE, in law, implies a purpose of committing mischief; and the previous intent to kill constitutes the crime in a case of murder; hence the words *ex malitia præcogitata* are indispensable to an indictment for murder.

MALINES, or MECHLIN, a town of the Netherlands, seated on the river Dele, is spacious, and regularly built; and contains a cathedral, six churches, and an arsenal, with a foundery of cannon. The chief manufactures are lace, bed-quilts, and thread. The population is about 16,600, and some trade in red wheat is carried on. This town suffered dreadfully in 1546, in consequence of a magazine, containing 2000 quintals of powder, being struck with lightning.

MALL, or MALLET, a small mace with which the ancient English archers dispatched their wounded enemies.

MALLARD. See ORNITHOLOGY.

MALLEABILITY, that property of metals by which they can be extended or drawn out. See CHEMISTRY and WIRE-DRAWING.

MALLET, a large round or square wooden hammer used by artificers with the chissel. Mallets for different purposes are used on ship-board, as the calking-mallet for driving oakum into the seams of a vessel, and the serving-mallet, by which the spun-yarn is bound about the rigging in a sufficient manner.

MALLET, DAVID, an English poet, was a native of Scotland, and born of humble parents about the commencement of the eighteenth century. While he attended the classes at Edinburgh in 1720, he was employed as tutor to the children of a Mr Home in the neighbourhood of that city; and in 1723 he was engaged to accompany the sons of the duke of Montrose to Winchester. In his poem of "Verbal Criticism," published in 1733, he pays respect to Pope, with whom, as well as several other eminent characters, he seems then to have lived in terms of intimacy. About this period he became under-secretary to Frederick, prince of Wales; and in 1734 he procured the degree of M.A. at Oxford. He was employed in 1740 to prepare a biographical sketch for a new edition of Bacon's works; and in this year also he was associated with Thomson in composing the "Masque of Alfred," which appeared at Drury-lane in 1751. He died in 1765. Mallet was author of several tragedies, none of which attained much popularity; and indeed his excellent ballad of William and Margaret is the only one of his poetical writings that is generally admired.

MALLICOLLO, one of the New Hebrides, in the Pacific ocean, extending about 20 leagues from south-east to north-west, with a harbour on the north-east side. The inland mountains are considerable, and covered with forests; and the principal productions are cocoa-nuts, bananas, bread-fruit, sugar-canes, oranges, yams, &c. Hogs and poultry are abundant. The natives bear some similarity to those of New Guinea. They wear a rope about the chest, but use little or no clothing. Bows and arrows form their weapons of defence. See Hebrides, New.

MALLOW, a borough town of Cork in Ireland, situated on the Blackwater, which is crossed by a bridge. It has some extensive linen manufactures, and sends two members to Parliament. A mineral spring proves an attraction for company to this place.

MALLOW, Malva. See Botany.

MALMESBURY, a borough town of Wiltshire in England, situated near the Avon, contains several irregular streets, a church, several meeting-houses, an alms-house, and a work-house; and the inhabitants, who, in 1811, amounted to 1152, are occupied in the manufacture of cloth, gloves, parchment, glue, &c.

MALO, or Malo, St. a sea-port of the department of Ille and Vilaine in France, with a good harbour and considerable trade. It is situated on an island which is joined to the main-land by a causeway.

MALONE, Edmund, a zealous commentator on the works of Shakespeare, was born in Dublin in 1741; and having acquired the principles of education, he entered the university of his native place in 1756, where he was distinguished by his talents, and obtained the degree of bachelor of arts. He became a student of the Inner Temple in 1763, and was some time after called to the Irish bar; but his views led him to settle in London. Amongst the different eminent characters of the metropolis whose acquaintance he courted was Mr Stevens, to whose second edition of Shakspeare he in 1780 supplemented two volumes. This gentleman, in the prospect of relinquishing his editorial labours, favoured Mr Malone with his collection of old plays; but the latter, by the publication of certain notes in his edition of Shakspeare which appeared in 1790, highly offended Mr Stevens, and their friendship was accordingly terminated. Mr Malone was next engaged in the defence of his favourite dramatist against the illusions of the *Irelands*; which he effected in a letter addressed to Lord Claremont. In the midst of his other avocations, he devoted his attention to the prose works of Dryden, which he collected from different sources, and published in 1800, together with a biographical sketch; and he likewise revised and published, in 1808, some writings of his deceased friend William Gerard Hamilton, to which was prefixed an account of his life. Mr Malone was about to publish a new and improved edition of his Shakespeare in 1812, when he died, in the 70th year of his age.

MALPAS, a town of Cheshire. See Cheshire.

MALPIGHI, Marcellus, an Italian physician, was born near Bologna in 1628. He successively devoted himself to the study of medicine and anatomy; and having procured his medical degree in 1653, he was honoured with the professorship of physic at Bologna in 1656, and shortly after with that at Pisa. In 1662, he succeeded Castelle in the medical chair at Messina, which he occupied several years. He returned to Bologna in 1666, and in 1691 he was appointed physician at Rome to Pope Innocent XII. He died in 1694, in the 67th year of his age. Malpighi was the first to examine, with the microscope, the circulation of the blood: and his writings have contributed materially to physiological science.

MALPLAQUET, a village of the Netherlands, remarkable for a signal victory obtained over the French, in 1709, by the Duke of Marlborough.

MALT. See Brewing.

MALTA, an island in the Mediterranean, between Africa and Sicily; is 20 miles in length, and 12 miles at its greatest breadth, and is remarkably well fortified. The coast is elevated, and presents a rugged aspect; but two convenient harbours are situated on the east and west sides of the island. Malta consists of white freestone, and is covered with a stratum of about eight or ten inches of earth, originally conveyed to it from Sicily. It is well planted, and produces excellent melons, oranges, lemons, figs, cassia, and anise-seed, and cotton, which latter is a staple commodity. Corn, wood, oil, wine, brandy, and cloth, are imported from Italy. Coral and other fisheries are a great source of employment here; salt and honey are plentiful; and manufactures of stockings and gloves are carried on to a considerable extent. The inhabitants amount to about 74,705; they bear some resemblance to the natives of Barbary, and speak the Italian and Arabic languages. The chief towns are La Valetta, Civita Vecchia, Citta Vittorioso, Senglea, Barmola, Citta Nuova, Cottonera, and Malta. La Valetta, the capital, is a fortified place, and is seated on the east coast. It contains the palace of the grand master, the church of St John, and hotels for the knights, besides the infirmary, and an arsenal. The island also contains many villages and country houses, and is most remarkable for extensive catacombs, which form a vast labyrinth near the ancient city of Melita.

MALTA, Knights of. See Knighthood.

MALTON, a borough town of North Yorkshire, situated on the river Derwent, over which there is a stone bridge to the opposite village. It contains three churches, and a population of 3000. It has a market on Saturdays.

MALVA, the mallow, a genus of plants belonging to the Monadelphia class. See BOTANY.

MALVERN, GREAT and LITTLE, two villages in Worcestershire, which are chiefly remarkable for chalybeate springs. The church of Little Malvern was adorned with painted glass windows by Henry VII. The Malvern hills, in the south-west of Worcestershire, extend about seven miles, and consist chiefly of limestone and quartz. The greatest height of these hills is 1313 feet above the level of the Severn, and on the summit of one of them stands the ancient fortress called the Herefordshire beacon, which is supposed to have been constructed by the Britons.

MALUS, ETIENNE LOUIS, an eminent French mathematician and natural philosopher, was born at Paris in 1775, and educated in his father's house. In his 17th year he composed *The Death of Cato*, a tragedy, in five acts; and such were his mathematical attainments, that he was chosen an officer of military engineers; and, having afterwards entered the army as a common soldier, he was soon elevated to the rank of captain as a reward for his singular talents. Malus commenced his military course in 1797, and was with the army of the Sambre and Meuse at the crossing of the Rhine, and at the battles of Ukrath and Alterkirk; and in Egypt he was engaged at the battles of Chebrees, the Pyramids, and Soasbich. He also discovered a branch of the Nile previously unknown, and became a member of the Institute of Cairo. At the taking of Jaffa he caught the plague, but fortunately recovered; and, about the year 1801, he married Mademoiselle Roch, daughter of the chancellor of the university of Giessen. He afterwards published his *Traité d' Optique*, in consequence of which the Institute of France appointed, as the subject of the prize for 1808, "To give a mathematical theory, verified by experiment, of the double refraction which light undergoes in traversing different crystallized substances." Malus consequently devoted himself to the subject; his invaluable Memoir of Double Refraction obtained him the prize in 1810, and at the same time he was elected a member of the Institute. In 1811, he was chosen director of the Polytechnic school; and in this year also the Rumford medals were awarded to him by the Royal society of London for his researches on light. The health of this remarkably ingenious philosopher now rapidly declined, in consequence of the diseases and fatigues to which he had been exposed in Egypt. He died in 1812, and Madam Malus survived him but a short period.

MAMELUKES, or MAMLOUKS, an ancient dynasty of Egypt. See EGYPT.

MAMMALIA.

MAMMALIA, derived from the Latin *Mamma*, is that branch of natural history which comprehends all animals provided with organs for suckling their young. The Mammalia class of Linnæus, with the exception of the lizard tribe, includes not only the viviparous quadrupeds, but also the cetaceous order and human species. How varied soever these may be in their nature, habits, and external appearance, minute investigation shews, that, in their inward structure, they are somewhat alike. All of them produce their young alive, and suckle them with milk from their breasts or teats; all breathe through lungs, and have red and warm blood; and in all, the heart is furnished with two auricles and two ventricles. The cetacea or whale tribe, have already been considered under ICHTHYOLOGY, and a separate article has likewise been allotted to MAN.

In considering this class of animals, many of which are familiar with our own species, there must be many circumstances connected with their habits and dispositions, their attachment to man, their sagacity and utility, eminently calculated to render the study of this branch of natural history peculiarly interesting and important. Most of the other species of animals shun the abodes and avoid the society of mankind; inhabiting an element peculiarly their own, the various tribes of fishes naturally conceal themselves from the curious and inquisitive eye of the naturalist; while most of the feathered tribes and numerous reptiles seem equally averse to come within the reach of minute observation, so that their natural habits and properties are more difficult to be fully ascertained. But although this class of animals has engaged much of the attention of the naturalist, of some of them we know little more than the names and the form; and in those distant regions of the globe which have never yet been explored, it is probable, that numerous facts regarding others, remain to recompense the toil and industry of future inquirers.

Among the earliest and most distinguished writers on this subject were Aristotle and Pliny; but of the voluminous works of the former, amounting to no less than fifty volumes, nine only remain; and regarding the general manners and habits of this class of animals which he has illustrated, it is worthy of remark that his descriptions are not materially different from those of modern authors. Pliny followed the former so closely, that he must be considered much in the light of a translator, although the brilliancy of his style may give something of the appearance of originality. Subsequent to these were Ælian and Opian; the former of whom mingled his descriptions of the various animals with many fabulous stories; and the latter, although he might perhaps have availed himself of the liberty of poetic fiction, rejected every thing of the nature of romance.

About the beginning of the sixteenth century, Conrad Gesner, whom Boerhaave styles *a monster of erudition*, collected a regular and curious museum of natural history, and published a copious account of animals, containing almost every thing at that time known of their manners and habits; and likewise his cotemporary, Aldovando, professor of botany at Bologna, furnished materials on this subject for thirteen folio volumes. The eminent Polish physician

Johnston next appeared, and added to the former classes several quadrupeds of the New World; and, since his time, numerous other writers have enriched this science by many valuable publications in various languages. The learned and ingenious Ray is known to have devoted fifty years of his life to the cultivation of this science, and being a person of great research and minute observation, has materially improved it by many useful and important discoveries.

Linnæus, so eminently distinguished above all the former writers on this subject, and who, in a greater degree than any of his predecessors, contributed to the systematic arrangement of this branch of natural history, has given a classification of animals at once concise and comprehensive, which, with a few variations, has till of late, been almost universally adopted. In 1751, Klein published a new system of quadrupeds, and in his first order, followed the arrangement of Ray, which he considerably improved; but in his second he was less fortunate, having combined animals of a very opposite nature. Pennant again, in his Synopsis of Quadrupeds, has greatly extended the system of Linnæus, by including various animals with which that celebrated naturalist was altogether unacquainted, and by giving the rank of species to others which he had considered only as varieties. Cuvier adopted a similar, but more extensive arrangement, dividing the mammalia into three general orders; *such as have claws or nails; such as have hoofs;* and *such as have feet like fins*; and these again, he subdivided into eleven different classes. Other writers of taste and accurate discernment, during the last century, have greatly enriched this department of natural history. Besides the popular works of Buffon, an excellent translation of which has been given to the public by the late Mr Smellie, printer in Edinburgh, and Goldsmith's Animated Nature, which is little more than an abridgment of the French naturalist; the reader will find much instruction in perusing the works of the late Dr Shaw of the British Museum, one of the most recent systematic writers on this subject; who, in his general Zoology, has avowedly founded his arrangement upon that of Linnæus, although, at the same time, he has made essential alterations and improvements. The reader will likewise not only be amused, but also instructed, by the perusal of Church's Cabinet of Quadrupeds; Kerr's edition of the Linnæan System; Bingley's Animal Biography; and Bewick's General History of Quadrupeds.

The systematic arrangement of Linnæus being the most generally adopted, and calculated to convey the most distinct ideas of the animals described, it, therefore, appears to be the best suited for a work of this nature, especially if the improvements of more recent writers, such as Cuvier, Gmelin, and Shaw, be kept constantly in view.

CLASSIFICATION.

The Mammalia class of animals comprises, first, such as are digitated or clawed; secondly, such as are hoofed; and thirdly, such as have neither hoofs nor claws.

I. Digitated or Clawed.

Order I. Primates.

Char.—Four incisors or front teeth; one canine on each side; two pectoral mammae; feet like hands, with flat nails.

Under this order are included five genera, Homo, Simia, Lemur, Galeopithicus, and Vespertilio.

Order II. Bruta.

Char.—Without front teeth in either jaw; feet with blunt nails like hoofs: feed chiefly on vegetables.

Nine genera are included under this order, namely, Bradypus, Myrmecophaga, Manis, Dasypus, Rhinoceros, Elephas, Sukotyro, Platypos, Trichechus.

Order III. Ferræ.

Char.—Fore teeth conic, usually six in each jaw, one canine on each side; feet digitated, with subulate claws.

Under this order are included ten genera, Phoca, Canis, Felis, Viverra, Mustela, Ursus, Didelphis, Talpa, Sorex, Erenaceus.

Order IV. Glires.

Char.—Fore cutting teeth, in each jaw two, and these remote from the grinders; canine teeth none; feet digitated: feed on herbs and fruits.

Ten genera are included under this order, namely, Hystrix, Lepus, Castor, Mus, Sciurus, Myoxus, Cavia, Arotomys, Dipus, Hyrax.

II. Hoofed.

Order V. Pecora.

Char.—Six or eight cutting teeth in the under jaw, remote from the grinders; in the upper jaw none; feet hoofed, cloven: herbiverous.

The genera under this order are eight, namely, Camelus, Moschus, Giraffe, Cervus, Antelope, Capra, Oris, Bos.

Order VI. Belluæ.

Char.—Cutting teeth, four in each jaw, obtuse; feet hoofed: herbiverous.

The genera are four, Equus, Hippopotamus, Sus, Tapir.

III. Hoofs or Claws None.

Order VII. Cete.

Char.—Breathing apertures on the head; fins pectoral; tail placed horizontally.

The genera are Balæna, Physeter, Delphinus, and Monodon. This order of animals has been already fully illustrated under Ichthyology.

ORDER I. PRIMATES.

Genus 1. *Homo.*

The structure of the human frame has already been considered under ANATOMY: the diseases to which it is incident belong to MEDICINE; and the reader is likewise referred to the separate article MAN.

Genus 2. *Simia.*

Char.—Front teeth four in each jaw, and near together; one canine on each side, separate, and longer than the others; grinders obtuse. Of this genus thirty-three species are described.

The species belonging to this second genus are usually divided into such as have no tails; such as have very short tails; and such as have very long ones; besides such as have prehensile tails; and under these four sections are included apes, baboons, monkies, and sapajous. A late writer Gmelin, has enumerated no less than sixty-three species of this genus. In the structure of their frame, and in their members and actions, they in many particulars have a strong resemblance to the human race. Possessing extraordinary powers of imitation, many of them are lively, active, and frolicsome; some of them are naturally mild, and others remarkably fierce and mischievous. As they chiefly inhabit the woods, and live on trees, their principal food consists of fruit and leaves, eggs, and the young of birds. They usually associate in vast companies together, preserving at same time the different species entirely distinct from each other. The activity which they exhibit in leaping from one tree to another, even though encumbered with their young, which they carry with them, is truly surprising. Their most destructive enemies are serpents, which often pursue and devour them; as do also leopards, and other animals of the feline race. They are chiefly inhabitants of the torrid zone, abound in China, Japan, and South America, and are sometimes, though seldom, used by the natives for food. So degraded is the human species, in some parts of India, as travellers inform us, that they have erected magnificent temples in honour of these animals, whom they worship as their divinities.

SECT. I. APES *without Tails.*

Spec. 1. *Satyrus.* Orang-Outang, or Wild Man of the Wood.—Of all the animals with which we are acquainted, this bears the strongest resemblance to the human form; and of all the ape kind this species is the largest, sometimes exceeding six feet in height. In his native forests he excels man in activity and muscular strength, and lives chiefly on fruits and other spontaneous productions of the soil. This singular animal has been minutely described by various travellers, particularly by Battel, M. Grose, Pyrard, and by a learned physician and naturalist Dr Tyson, who describes his body as entirely covered with hair of a dark colour, the texture of which can scarcely be distinguished from that of man. In his countenance he resembles the human species, with the forehead somewhat longer, and the head round. The chief difference consists in the remarkable length of the arms, and shortness of the thighs; and although the palms of the hands have similar lines to those of the human species, they are nevertheless longer and narrower. The toes of the feet are much longer, and the distance between the large toe and the others much greater than in man. The eyes also are less prominent, and the nose flat. He is likewise dissimilar in his internal conformation having thirteen instead of twelve ribs. Though his resemblance to the human species, therefore, be in some respects peculiarly remarkable, yet in others he is very different; so that what Buffon has observed concerning him is strictly consistent with truth. "The interval," says he, "which separates the two species, is immense; the resemblance in figure and organization, and the movements of imitation which seem to result from these similarities, neither can approach the nature of man nor elevate him above that of the brute."

It is obvious that, by nature, the Orang-Outang was originally intended for walking on four legs like the rest of the quadruped creation, and it appears that, in a state of nature, they never go in an erect posture, but run upon all fours, excepting when they are climbing trees; and this indeed is the more certain, from the palms of their hands, as well as the soles of their feet being beaten and callous, which never could be the case unless used in this manner. Travellers indeed inform us, that as soon as these animals are caught, their hands are fastened behind them, that they may be forced to use an erect attitude in walking.

The animals of this species generally reside in the most solitary deserts, and shun the society of the human race. They chiefly abound in the interior parts of Africa and Madagascar, in the isle of Borneo, and in some parts of the East Indies. There are two varieties of them,—the great Orang-Outang, distinguished by the name of Pongo, and the other by the name of Jocko. The former of these is said to be so powerful that, when full grown, he cannot without great difficulty be taken alive. Count de Buffon gives the following account of a Jocko which he met with in France: "I have seen this animal present his hand to conduct the people who came to visit him, and walk as gravely along with them as if he had formed a part of the company. I have seen him sit down at table, unfold his towel, wipe his lips, use a spoon, or fork, to carry his victuals to his mouth, pour his liquor into a glass and make it touch that of the person who drank along with him. When invited to tea, he brought out a cup and saucer, placed them on the table, poured out the tea and allowed it to cool before he drank it. All these actions he performed without any other instigation than the signs or verbal orders of his master, and often of his own accord. He did no injury to any person; he even approached company with circumspection, and presented himself as if he wanted to be caressed. Dr Tyson states, that an animal of this species, in its passage to England, had many friends on board, towards whom it would shew evident marks of tenderness and great affection." Monkeys of a lower species it seemed to hold in absolute aversion, and would avoid that part of the vessel where they were confined. As soon as it was accustomed to the use of clothes it became very fond of them, and would dress itself in part without any assistance, and carry the remaining part to some of its friends and make signs for them to complete the ornament. It would lie in a bed, place its head upon a pillow, and then pull up the bed clothes to its neck, in the same manner as human beings are accustomed to do."

From these circumstances, and from the extraordinary powers of imitation which they possess, it appears at least that the milder kind of this species, when taken young, may be tamed and rendered very tractable. The larger and fiercer kind, in their wild state, are extremely formidable, generally going in companies, and being armed with thick clubs and other weapons, with which they frequently assail the strongest and fiercest animals, and are not afraid to attack even the elephant himself. The Orang-Outang is frequently hunted like the lion and the elephant, and other wild animals, by the inhabitants of the island of Borneo, and the king frequently amuses his courtiers by pursuing this animal in the chase.

Spec. 2. *Lar.* Gibbon, or Long-armed Ape.—*Char.* Colour usually tawny or black; arms as long as the body; no callosities behind; face flat, encircled with grey hair; eyes large and deeply sunk; ears round and naked.

This animal, which is of a tractable and gentle nature, chiefly abounds in the Molucca isles, Sumatra, and the East Indies; is from three to four feet in height, and lives on fruits and the bark of trees.

Spec. 3. *Innus.* Maggot, or Barbary Ape.—*Char.* Callosities behind; prominent nose; large oblong head; cheek pouches; ears round like the human; body covered with hair of a pale brown.

This species is a native of Africa, from Barbary to the Cape of Good Hope; is found also in Arabia and Tartary; and is less tractable and docile than the others. They frequently assemble together in large groups, and rob the women of their provisions as they are travelling to market. The Arabs make use of their flesh for food.

Spec. 4. *Sylvanus.* Pygmy.—*Char.* Round head, callosities behind, colour pale brown.

This species is much smaller than the former, and about the size of an ordinary cat. It is supposed by Mr Pennant to be the *pithecos*, or pigmy of the ancients, and represented by them as waging almost constant war with the cranes; and the fable of the wars between the pigmies and cranes may probably have originated from their fondness for eggs. It abounds in Africa, and is often found also in India, and in the island of Ceylon. They live chiefly on fruits and insects, assemble together in troops, and defend themselves by throwing behind them clouds of sand to facilitate their escape by blinding their enemies. They are represented as exhibiting extraordinary marks of cunning and sagacity in robbing orchards and gardens. Previous to the attack, one of them issues out of the wood, and ascends to the summit of some neighbouring hill, from which he is able to observe if any interruption is likely to come in the way of accomplishing their object; and if no individual is any where to be seen, he gives a signal, by a scream, for his companions to advance; and as soon as he can discover any person approaching, he raises a hideous cry, at which his associates make the utmost exertion to effect their escape. They are frequently destructive to corn fields, wasting infinitely more than they make use of. The residence of this species is chiefly in caverns, in which they are often caught by the following stratagems: Their haunts being known, the natives entice them in numbers by placing intoxicating liquors within their reach, of which they drink with the utmost avidity, till they are overpowered and fall asleep, when they become an easy prey to the hunters.

SECT. II. BABOONS. *Tails generally short.*

Spec. 1. *Sphinx.* Great or Common Baboon.—*Char.* Colour brown; large red callosities behind; face of a flesh colour, and nails pointed; tail about seven inches thick, and crooked; snout protruded; eyes sunk and hazel; upper part of the body very muscular; cheek pouches.

The common baboon differs materially from the ape, not only in his outward form, but likewise in disposition. Naturally ferocious and untractable, he is equally disgusting in his manners and outward appearance; he is always endeavouring to indulge his savage propensities by exhibiting symptoms of rage in grinding his teeth; so that in confinement he frequently shakes the bars of his cage with so much strength and fury as to excite in the spectators no small apprehension of danger. This species, like the other animals of his kind, frequently assemble in large troops, and not only plunder gardens and cultivated fields, but frequently rob houses, in the absence of the inhabitants, of all kinds of provisions. So peculiarly alert and dexterous are they in the plundering of gardens, by throwing the fruit from one to another, that in a very short time they do incredible mischief. Though naturally very fierce, they can be tamed to a considerable degree when taken young, and are frequently taught to watch the house like a dog. They propagate only in hot climates, and the female usually brings forth one at a time, which she carries in her arms, and suckles at her breast.

Spec. 2. *Maimon.* Mandril or Ribbed-nose Baboon.—*Char.* Face flat, naked, and of a fine violet blue; cheeks furrowed, skirted with bushy hair, and of a greenish colour, beautifully varied with black; nose flesh coloured; short thin beard, of an orange colour; hair of the body olive brown, with a mixture of green on the sides and back. It has cheek pouches, and feeds on fruits and vegetables. Like all others of its species, it is playful and lively, full of mischief, and in constant motion. It is a native of the coast of Guinea.

Spec. 3. *Nemestrina.* Pig-tailed Baboon.—*Char.* Tail short and naked like that of a pig; colour deep olive-brown, and pale on the belly; face and ears naked and flesh coloured; cheek pouches; red coloured callosities on the buttocks.

This being the least of all the baboon kind, is about the size of a cat, and, although lively and frolicsome, is nevertheless mild, gentle, and tractable. It is to be found in Sumatra and Japan; but seldom lives long in a cold climate.

Species 4. *Hamadryas.* Dog-faced Baboon.—*Char.* Hair long, and flowing over the shoulders, having somewhat the appearance of a mantle of a dusky colour, with small specks ; nose red and naked, and face very prominent.

The tail of this animal is like that of a monkey, although he is distinguished by the habits of the baboon. He seems to be the link which unites the monkey and the baboon race together ; is found in Africa and Asia ; is exceedingly strong, vicious, and untractable, and often commits great depredations in coffee plantations and cultivated grounds.

Spec. 5. *Ursine.* Is considered a variety of the preceding, though rather smaller ; its forehead is high and prominent ; body strong and muscular ; ears long ; head large, having long upright hairs on its crown. This species is a native of the Cape of Good Hope. Troops of them frequently assemble together on the summit of the rocks, and roll down stones on travellers as they pass. They are much addicted to theft ; and, having concerted measures for plundering a garden, they always place a centinel to prevent a surprise, and, upon the first appearance of a human being, they retreat, with a hideous yell, in the utmost precipitation.

SECT. III. MONKEYS. *Tails commonly long.*

Spec. 1.—*Diana,* or Spotted Monkey.—*Char.* Black with white spots ; face, ears, and feet black, with a white line from the nose, passing in an arched direction over each eye to the ears ; beard white beneath.

Mr Pennant differs a little in his description of this animal, representing it of a reddish colour, with white specks as if singed, and of a moderate size.

Spec. 2. *Sinica.* Chinese monkey,—so named from its hair on the head having the appearance of a Chinese cap ; its colour is brown, inclining to yellow ; body of a dusky iron colour ; tail very long.

In Ceylon they are very numerous, inhabit the woods, and are extremely destructive to gardens and cultivated fields. Besides fruits and succulent plants, which they prefer, they often eat insects, crabs, and shell-fish, which they catch in the most dexterous manner. They are seldom completely tamed, and, when kept in confinement, are uniformly chained.

Spec. 3. *Mona.* Varied Monkey.—*Char.* Face of a dark lead colour ; upper part of the head bright yellow, with black spots ; body olive rusty brown, white beneath, and with bearded cheeks.

Like all the rest of its species, it has cheek pouches, in which it can preserve a supply of food for some days. It is about a foot and a half in length, with the tail nearly two feet long. It is an inhabitant of the northern parts of Africa, Arabia, and Persia, where it is called the Mona, from the African word *monne,* which Pennant supposes to be a corruption of monichus. This is one of the largest species, and is remarkably tame and gentle, and seemingly affectionate to its keepers.

SECT. IV.—SAPAJOUS. *Cheek pouches none, tails prehensile, and covered haunches.*

Spec. 1. *Seneculus.* Royal Monkey, Howler, or Old Man of the Woods.—*Char.* Red coloured, and bearded ; mouth like the human ; chin prominent.

This species is common in Cayenne, and sometimes in Brazil, and although seldom to be seen in large numbers, is often met with in pairs. They are so extremely noisy, especially in the morning and evenings, that, from the horrible screams which they utter, frequently so loud and so various, one would suppose all the savage inhabitants of the forest must have united the utmost strength and force of their lungs to produce it, and yet it appears that such a noise has been produced only by a solitary individual.

Spec. 2. *Belzeebub.* Preacher Monkey.—*Char.* Beard dark and thick, hangs from the chin about three inches ; body covered with long glossy hair, shining black, forming a ruff round its neck ; body of the size of a large fox, with a long tail, twisted at the end.

This is the largest of the American monkeys, and is a native of South America, chiefly inhabiting Guiana and Brazil. From the strange and doleful noise which these animals frequently make, they have been termed howling monkeys ; and the dreadful screams they frequently utter is supposed to be produced by means of a hollow bony substance in the throat. They bite most cruelly, and are very spiteful, and when pursued by the hunters defend themselves with the utmost vigour. They frequently assemble together in parties of twenty or thirty, and having arranged themselves in order, one of them sets up a howl so loud as to be heard at a great distance, and so varied that one would imagine a great number had joined in the cry. In a short time a signal is given with his hand, when the rest unite in the general chorus, all sending forth the most horrible discordant noise that can be conceived. On another signal given, all of them are silent ; and then the first proceeds to finish his oration, and the assembly is dissolved. When pursued by the hunter, they never abandon each other, and they throw themselves with astonishing velocity from one branch of a tree to another, always catching hold of the branches either with their tail or hand, and these they never quit even after they are mortally wounded. During the time they are pursued, they utter most tremendous screams, always throwing at their pursuers the dried branches of the trees wherever they can find them. They live on fruits, grain, and herbs ; and their flesh is used by the natives, and is by them considered extremely good. Mr Oxmelin mentions a singular circumstance of these animals, which has been observed by the hunters, that as soon as one is wounded the rest collect about him, and put their fingers into the wound as if they meant to probe it ; and when much blood is discharged some of them keep the orifice shut, while others make a mash of leaves and dexterously stop it up.

Spec. 4. *Paniscus.* Four-fingered Monkey.—*Char.* Body and limbs long and slender ; bearded black ; tail long ; feet four-toed ; face of a dark flesh colour ; instead of thumbs on the fore feet it has small projections.

This species is a native of South America, and is of a mild, gentle, lively disposition. They also assemble in troops, assailing travellers as they pass with many mischievous gambols and menacing gestures, leaping with surprising agility from tree to tree, chattering violently, and throwing down pieces of dry branches to alarm and intimidate the passengers. They are natives of Guiana, Brazil, and Peru, and fatten during the fruit season, when their flesh is considered as excellent food. This animal is the *coaita* of Buffon, of which there are many varieties, some wholly black, others brown, and some of a whitish colour in the under part of the body. From their long slender legs and tails, they have also been called spider-monkeys; and the *esquima* of Count de Buffon, which is nearly of the same size and colour, is supposed to belong to this species, as it is an inhabitant of the same country, is similar in its mode of living, and, being destitute of the thumb, has only four fingers on each hand.

Genus 3. *Lemur.* Macauco.

Char.—Front teeth, four above, remote from the intermediate, six in the under jaw, extended forwards; tusks solitary and approximated; grinders several, with blunted tubercles, foremost of them longer and shorter than the rest.

This genus of animals resembles the monkey in the structure of the feet; some of them have tails of an extraordinary length, and others none. In their manners and disposition they differ materially from the monkey tribe, being peculiarly gentle and inoffensive. There are thirteen species of them, and they chiefly live in remote forests, on fruits and vegetables, and propagate only in the warmer climates.

Spec. 1. *Tardigradus.* Slow Lemur.—*Char.* Without tail; ash-coloured, dorsal line brown; head small; nose pointed: eye encircled with white, with an outer ring of black; toes naked, nails flat, excepting on the inner toe of each hind foot, which are long, crooked, and sharp.

The construction of its body is very singular, being longer in proportion to its thickness than perhaps any other quadruped; its length from the rump to the nose is about fifteen inches. It inhabits Bengal and the island of Ceylon, confining itself to the woods, and feeding on fruits. When domesticated, it is remarkably fond of eggs and small birds, which it devours with the greatest avidity. Inactive in its nature, and slow in its motions, it creeps along the ground, and, when much disturbed, makes a plaintive noise, somewhat resembling that of a squirrel. In the account which Sir William Jones gives of one of these animals which he had in his possession, he is represented as fractious and irritable in the cold season, but at other times gentle and affectionate. Soon after sun-rise he uniformly rolled himself up like a hedgehog, and in that position continued generally to sleep without interruption till a little before sunset, when he licked and dressed himself like a cat. Soon after breakfast he took a sleep, and never recovered his vivacity till the sun was set. He was in general fond of fruit, was eager in lapping milk, and shewed a peculiar predilection for grasshoppers, often passing the whole night in search of them during the hot season. In the evening he generally stood erect for a few minutes in his cage, playing on the wires with his fingers; but the posture he seemed fondest of was to cling with his fore paws to the upper wires, his body being thus inverted; but when the day brought back his night, his eyes lost their lustre and strength, and he composed himself for a slumber of ten or twelve hours. His pace is so very slow that he seldom exceeds six or eight yards in a minute.

Spec. 2. *Catta*, or Ring-tailed Macauco.—*Char.* Nose long and sharp like that of a fox; paws like those of a monkey; eyes large and brilliant, and surrounded with black; head, throat, and belly white; back of an ash-colour; hair very fine, close, and soft like the pile of velvet; tail, which is about twice the length of the body, marked with alternate rings of black and white; long body and slender limbs.

This animal, which is a native of Madagascar and the surrounding islands, is about the size of a cat, and is very beautiful; has all the vivacity of the monkey without its mischievous disposition, and, when taken young, may be easily tamed. It carries its tail almost erect, except when in a sitting posture, and it is then twisted round the body and turned over its head. In the wild state they are seen in troops of thirty or forty.

Spec. 3. *Loris.* Loris.—*Char.* No tail; ash coloured; large ears; limbs extremely slender, and hind legs considerably longer than the fore; nose pointed like that of a dog; high forehead; fur short, and remarkably soft.

This animal is about the size of a large squirrel, and its thumbs are farther separate, and more distinct from the toes than in the other macaucos. It is a native of Ceylon, lives in the woods, and feeds on vegetables.

Spec. 4. *Mongooz.* Woolly Loris.—*Char.* Soft woolly fur, deep ash colour; cheeks white; short ears; eyes of a beautiful orange, surrounded with black; tail very long; feet naked; nails flat, excepting one on each inner toe of the hind feet. It is a native of Madagascar and the neighbouring islands. Inhabits the woods; lives on fruits; is delicately tender, and very playful.

Genus 4. *Galeopithecus.* Caluga.

Char.—No front teeth above; six in the lower jaw, short, and formed like a comb in the upper surface; canine teeth very short, broad, and serrated; four grinders, truncated, with blunted tubercles.

This singular animal has been entirely overlooked by Buffon, although it unquestionably claims no inferior place in the history of animals; while Linnæus, without being acquainted with its generic character, assigned it a place in the genus Lemur, noticing at same time that no opportunity had been afforded him of examining its teeth, and accurately determining to what genus it belonged. Dr Pallas, however, as may be seen in the Transactions of the Academy of Petersburgh of 1780, has furnished sufficient materials for accurately determining its generic character.

Volans. Flying Lemur or Caluga.—*Char.* The body of this animal is about three feet long, its back of a lively cinnamon colour, crossed handsomely with blackish lines, but paler under the belly; long head, small mouth, with teeth unlike those of any other quadruped, the under incisors being deeply cut like a comb, the canine teeth triangular, short, and very broad at the base; tail about six inches in length; body, except when the flying membrane is expanded, seems very slender. The flying skin which surrounds this animal, reaches from the neck to the legs and tail; and the hair which covers it is delicately soft. The creature climbs like a cat upon trees, and when it runs it occasionally sustains its body in the air by means of its flying skin.

This species is a native of the Philippine, Molucca, and Pelew islands; lives on fruits, and occasionally on insects; frequents the woods, and generally resides upon trees, from which it descends by spreading its membranes, and balancing itself in the air till it reaches the spot to which it directs its course. It produces two at a birth, which are said to cling to the parents breasts by the teeth and claws.

Genus 5. *Vespertilio.* Bat.

Char.—Teeth approximated, sharp, and erect; skin surrounding the body laterally prolonged to the extremities of the toes, by which it is enabled to fly; hands palmated, and ears generally large in proportion to the size of the animal.

Bats are to be found in many different regions, and all of them have two breasts, with which they suckle their young, and to which the young adhere. Those of warmer climates are generally of a large size. Three species of them are inhabitants of Britain; in the warmer climates of Asia and Africa, and even in America, there are several, but in the West Indies there is only one. The larger species live upon birds, and sometimes even seize upon the smaller quadrupeds, whilst the least of the species feed chiefly on insects. Their wings consist of a membrane light and delicately formed, covering the body entirely round from one shoulder to another, connecting the fore and hind legs, extremely flexible, and capable of being either drawn together into innumerable folds to occupy the smallest space, or of being widely extended, for the purpose of flying. It appears that these animals have little or no use of their eyes, which are scarcely perceptible, and that they are capable of directing their course without the use of vision. Abbé Spallanzani made various experiments upon several animals of this genus, from which it appeared they could fly about when their eyes were covered, and indeed after they were entirely destroyed, without feeling incommoded in the smallest degree; and that even in this situation they could suspend themselves, when they wished to rest, with the same facility as if they had possessed the sense of vision; that they could skim backward and forward through a moderate aperture, without coming in contact with the frame; and that they were as lively in their flight as they could have been had they enjoyed the most perfect vision. Experiments of a similar nature were likewise repeated by Spadoni at Bologna, Vasalli at Turin, and Jurin at Geneva. The following experiment was tried by the last mentioned individual. He suspended several twigs of willow, about three feet in length, in a large room, at the distance of about half a foot from each other; and two bats being let loose, they passed and repassed in all directions without coming in contact with them. After their eyes were scooped out, they still continued to pass and repass as before, without touching the twigs; and when several of these openings were shut, they passed through others without contact, having directed their course transversely for this purpose. No satisfactory account has yet been given of this surprising phenomenon, although Mr Jurin, from dissections, has observed that in these animals a vast number of nerves are expanded on the upper jaws and the organ of hearing, which he conceives to be the occasion of the extraordinary peculiarity already described. It is supposed, also, by another naturalist, Mr Carlisle, that the sense of hearing in these animals is so peculiarly delicate as to enable them to avoid every impediment in their flight without the use of the organ of sight. In his experiments he observed, accordingly, that when the ears of the blinded ones were closed up, they frequently struck against the objects that impeded their flight, without being able to avoid them.

Some of the larger species of bats are extremely fond of blood, and are said to attack men and other animals when asleep, and so dexterously to pierce the skin as to suck the blood without disturbing the victim. These animals, as they usually retreat to dark and solitary caverns, and seldom appear but in doubtful light, have therefore excited superstitious notions in the minds of the ignorant. The poets of ancient times have considered this animal as an inhabitant of the infernal regions, and dedicated the bat to Proserpine: and Homer has used their sable aspect and horrible shrieks for the purpose of imparting terror to his ghosts and shades. Of this genus there are about twenty-four species.

SECT. I.—*Bats with Tails.*

Spec. I.—*Murimus.* Common Bat.—*Char.* Ears shorter than the head; lips and nose simple.

This species is about two inches and a half in length, and when full grown the wings extend about nine inches. Its fur is of a mouse colour, tinged reddish. In its flight it usually keeps near the ground, with an irregular jerking motion; and in its pursuit after food, such as gnats, and other aquatic insects, it skims close by the surface of the water. It appears only about twilight and during the night. When it alights, it has been alleged, although perhaps erroneously, that it is under the necessity of crawling to some height before it can recover its flight. In winter it is torpid, but revives during the spring; and, while the weather is dry, it generally comes abroad at twilight. This species is every where to be found throughout Europe, and particularly in Britain; and although it chiefly lives upon moths and other insects, it is, nevertheless, voracious of flesh in any state, whether raw or roasted, fresh or corrupted. Its greatest enemy is the owl. The summer is the season of breeding. Sometimes these animals are roused from their torpid state during a mild and warm day, when they venture abroad in search of food; but on feeling the severity of the cold, they soon retire to their former state of hybernation. During the day time, in summer, they conceal themselves in caves, or in roofs and eaves of old buildings; and, when the weather is moist and stormy, they can pass several days without food. To enable them to gather their food with facility, their mouth is very large, reaching almost from one ear to the other. At the commencement of winter they commonly retire to holes, caverns, and old houses, where they commence their slumber, and where they are suspended by the hind legs, often in large clusters, and enveloped in their wings, in order to protect themselves against the effects of the winter frost. During that period it is extremely doubtful if they respire at all, or if the circulation of the blood, and action of the heart, be carried on. A severe winter is more favourable to them, during their long lethargy, than a mild one; because, during the cold, their digestive powers are languid and dormant. When roused from their slumber by unseasonable warmth, they have seldom been known to survive longer than three days; and if brought too near the fire, in their torpid state, they suddenly die.

Spec. 2. *Auritus*. Long-eared bat.—*Char.* Nose inappendiculated; ears double, and larger than the head, very thin and almost transparent, having a membrane within resembling an ear. The animal itself is only about an inch and three quarters long, and its wings extend about seven inches.

This, and the species already described, are the most common in Britain, and remain in a torpid state during winter. They are supposed to produce two at a birth, which they suckle, and which are at first perfectly naked, and cling to the body of the dam with great tenacity, even during flight. By throwing up the large heads of thistles covered with flour, or by striking at them with a handkerchief or towel fastened to a pole, these animals are often brought to the ground and caught. Like the mouse, it may to a certain degree be tamed; and Mr White, in his natural history of Velborne, mentions a variety of circumstances respecting a tame one which he had seen in 1766. "It would take flies out of a person's hand. If you gave it any thing to eat, it would bring its wings round before the mouth, covering and hiding its head in the manner of birds of prey when they feed. The adroitness it shewed in shearing off the wings of the flies, which were always rejected, was worthy of observation, and pleased me much. Insects seemed to be most acceptable, though it did not refuse raw flesh when offered; so that the notion that bats go down chimneys and gnaw men's bacon, seems no improbable story. While I amused myself with this wonderful quadruped, I saw it several times confute the vulgar opinion, that bats, when down on a flat surface, cannot get on the wing again, by rising with great ease from the floor. It ran, I observed, with more dispatch than I was aware of, but in a most ridiculous and grotesque manner."

Spec. 3. *Ferrum Equinum*. Horse-shoe Bat.—*Char.* The membrane round its nose and upper-lip shaped like a horse-shoe; ears long and broad at the base, no internal ear; tail half the length of the body; back ash-coloured; belly whitish.

This species varies in size, the largest about three inches and a-half, and the extent of the wings about fourteen. Buffon describes it as a native of France, though it is seen sometimes, but rarely, in England.

SECT. II.—*Bats without tails.*

Spec. 1. *Spectrum*, Spectre Bat.—*Char.* Nose long; teeth large; ears broad, long, and upright; a conic erect membrane at the point of the nose, like a horn, flexible and bending at the end; hair on the body long and cinereous.

Its wings extend not less than two feet two inches, and from the end of the nose to the rump seven and a-half. While other species of the bat usually reside in deserted places, these frequently make their appearance in towns and cities, after sunset, in vast multitudes, to the great inconvenience of the inhabitants. This large species is found in South America and in New Holland, where, Condamine states, they were very destructive to the cattle of the missionaries. In New South Wales, near Port Jackson, many thousands were seen within the space of less than a mile, and some of them being taken alive, became perfectly tame in a few days, eating their food from the hand. The smell of these animals is said to be very strong and offensive.

Spec. 2. *Vampyrus*. Vampyre, or Ternate Bat.—*Char.* Large canine teeth, four cutting teeth on each jaw; sharp black nose; large naked ears; tongue pointed, terminated by sharp prickles; talons strong and very crooked; the membrane divided quite to the rump behind; head like that of a fox, and of a dark ferruginous colour. On the neck, shoulders, and under side, of a lighter and brighter red; on the back the hair shorter, smooth, and dusky; membrane of the wings also dusky, although they vary in colour, some being of a reddish brown. These terrible monsters are natives of the warmer climates, and chiefly inhabit Guinea, Madagascar, and the surrounding islands. They are likewise found in New Holland, in the Friendly islands, and in South America. Of this species there are several varieties; but the largest, or great ternate bat, is about a foot in length, with wings generally about four feet, although some of them have been seen fully six feet in extent. Sir Hans Sloane had a specimen of one from Sumatra, whose wings measured seven feet. They flock together sometimes in such vast numbers as to obscure the air, commencing their flight from one island to another about sunset, and return in the same manner to their haunts before sun-rise. During these nocturnal expeditions they indiscriminately devour fruits, flowers, and insects, laying waste the ripe produce of the country wherever they go; and make such a hideous noise, that they may be heard at a great distance. They are particularly fond of fruit, and will suck the juice of the palm-tree till they become quite intoxicated, and fall insensible to the earth. Large clusters of them have frequently been seen reposing on the same tree with their wings folded and their heads hanging down; and Dr Forster states, that he found several hundreds of them hanging, some by the fore-feet and some by the hands, on one tree. At certain seasons they become very fat, and the Indians consider their flesh, when young, as excellent food, resembling in taste a rabbit or partridge. This formidable animal has been considered by Linnæus as belonging to that species which are so destructive to mankind in warmer climates, and are so fond of blood that they often attack men and other animals whom they find asleep, and are said to introduce their sharp pointed tongue so dexterously into the vein that they satiate themselves with blood, during which time, by the fluttering of their wings, they lull their victim into a deeper slumber. It is supposed that Captain Stedman was attacked by one of this species at Surinam. "On awaking," says he, "about four o'clock one morning in my hammock, I was extremely alarmed at finding myself weltering in congealed blood, and without feeling any pain whatever. Having started up, I ran for the surgeon; he discovered that I had been bitten by the vampyre, or spectre of Guiana. This is no other than a bat, of monstrous size, that sucks the blood from men and cattle while they are fast asleep, even sometimes till they die."

The cruelty and voracity of these creatures, and their loathsome and disgusting appearance, probably suggested to the ancients the fable of the harpies. This larger species of bats has been noticed by several of the Greek historians, and particularly by Herodotus and Strabo, the latter of whom represents them as palatable food used by the natives of Mesopotamia and the adjacent countries.

ORDER II. BRUTA.

Char.—Without front teeth in either jaw; feet with blunt nails like hoofs; feeds chiefly on vegetables. Nine genera are included in this order.

Genus 1. *Bradypus.* Sloth.

Char.—Cutting teeth in either jaw, none; canine teeth single, obtuse, and longer than the grinders; grinders five on each side, longer in front, without tusks; hind legs shortest; claws very long and sharp pointed; body covered with hair.

The movements of the animals of this genus being very slow, they have obtained the name of sloths. There are only three species, one of them belonging to India, and the other two being inhabitants of the continent of South America They are of a mild and gentle disposition, and feed chiefly on vegetables. Were we to judge of this animal from his external appearance, we should suppose him to be most miserable and helpless, his motions appearing to be most painful, and to these he is capable of being excited by hunger alone. As the verdure of trees constitutes his principal food, and as he can only ascend them with the most painful exertions, he remains upon the tree till he has devoured every thing but the bark, when he throws himself upon the ground, where he remains till he is forced by hunger to renew his toil. His defence chiefly consists in the lamentable cries which he utters in consequence of his movements, and with which he alarms and terrifies even the beasts of prey. He is capable of enduring hunger for a very long period, and is remarkably tenacious of life. It is said that one of them, when brought to the Jesuits college at Carthagena, attached himself to a long pole that was put under his feet, and remained upon it without the smallest sustenance for a period of forty days. These animals possess great strength in their legs and feet. One of them having been attacked by a dog, seized him and held him fast until the dog perished for want of food. The female produces one at a time, which she often supports upon her back.

Spec. 1. *Tridactylus.* Three-toed Sloth.—*Char.* Three claws on each foot.

The body of this animal is thick and unshapely, his legs are awkwardly placed, the hind ones being shorter than the fore, which seem very much to impede his progress. His hair is extremely coarse, and of a light brown colour, thick, and mixed with white, and somewhat like that of a badger. The eyes are small, dark, and gloomy; the face naked, and of a dirty white colour. This animal is about the size of a small dog, creeps with its belly on the ground, and its journey seldom exceeds sixty paces in a day. He is a native of South America, and has never been found in any other quarter of the globe.

Spec. 2. *Didactylus.* Two-toed Sloth,—without tail, two claws on fore feet; head short and round, like that of a monkey. It resembles the former species, but more slender in shape, and covered with smoother hair; is a native of South America, and is also found in India and Ceylon.

Spec. 3. *Arsinus.* Ursine Sloth.—*Char.* Snout long; feet five-toed; eyes very small, and ears little, and partly hid in the long hairs; front teeth wanting, canine teeth two on each jaw; colour black; hair long and shaggy.

In its aspect this animal has a great resemblance to the bear, although it seems to have no affinity to him except in size and habit. The knowledge of this species, which is by far the largest, was but lately introduced into this country from the neighbourhood of Patna in Bengal.

Spec. 4. *Megatherium.*—This animal is known to modern naturalists only by its fossil skeleton; and Cuvier is of opinion, that it, and some other large quadrupeds, named mammoths, ought to form a new genus between sloths and ant-eaters, although he observes that this animal is allied to the present genus more than to any other. See *Animal Remains* under GEOLOGY, and likewise Plate 93. Fig. 2.

Genus 2. *Myrmecophaga,* Ant-eater, or Ant-bear.

Char.—Teeth none; snout very long, and of a cylindrical form, serving as a sheath to its slender tongue, which is always in a double fold; body covered with pretty long hair.

Spec. 1. *Jubata.* Great Ant-eater, or Ant-bear.—*Char.* Nose long and slender; eyes black; ears short and round; tongue slender, two feet and a half long, lies double in the mouth; legs slender; four toes on the fore-feet, five on the hind; middle claws on the anterior feet very large and hooked; hair on the upper part of the body black, with a mixture of grey, and very long fore legs, whitish; tail two feet and a half long, and from the nose to the rump about four feet.

This animal is a native of South America and of the kingdom of Congo in Africa. It collects its food, which consists wholly of ants, by thrusting its tongue into their nests, after which, loaded with prey, it withdraws it again into its mouth. Though destitute of teeth it is very formidable, and few animals can extricate themselves from its grasp. Like the bear, he fights on end when first attacked, and furiously assails his enemy with his terrible claws; he afterwards throws himself down upon his back, using all his feet, and in this situation continues to fight till the last extremity, nor does he relinquish his enemy for a long time after he has killed him. He is extremely tenacious of life, and his skin being remarkably thick, he is capable of making a more determined resistance than almost any other animal. At a distance he has the appearance of a fox, and by some travellers has therefore been called the American fox. To protect himself from the rain, he covers himself with his tail during sleep. The Indians make use of his flesh, although it tastes strong and is far from being palatable.

Spec. 2. *Tetradactyla.* Middle Ant-bear or Ant-eater. *Char.* Four strong claws on the fore-feet; five on the hind; length from the nose to the tail one foot seven inches; tail ten inches long, which it twists round the branches of trees in climbing. It is a native of South America.

Spec. 3. *Didactyla.* Little Ant-bear or Lesser Anteater.—*Char.* Nose conic and bending down; ears small and concealed in the fur; two strong claws on the fore-feet hooked, the exterior being much the largest; four on the hind-feet; fur long, silky, and soft, colour yellowish brown; length from nose to tail seven inches and a half; tail above eight inches, thick at the base, taper, and the last four inches naked on the under side. It is a native of Guiana, and lives on a species of ants which hang their nests upon the branches of trees.

These animals are likewise found at the Cape of Good Hope and at Ceylon. There are several varieties, which differ greatly in form.

Genus 3.—*Manis.*

Char.—Teeth none; tongue cylindric and extensile; mouth narrowed into a snout; body covered with sharp pointed scales.

The animals of this genus differ from those of the former, chiefly in the covering of the body, every part of which, except the belly, is defended by a suit of armour consisting of extremely strong and large horny scales, with which, when rolled up, they are capable of defending themselves against the attacks of their most formidable opponents. These scales they can raise at pleasure, and thus present to their enemies a most threatening and formidable appearance. When opportunities offer, they are said to attack the elephant himself, by twisting themselves round his trunk; and, by compressing it with their hard scales, they at length destroy him. These animals, from the external covering of the body, bear some resemblance to that of the lizard tribe, and have, therefore, been denominated scaly lizards. On a more minute observation, it is obvious that they form a kind of link between the lizard tribe and viviparous quadrupeds. They are perfectly harmless in their nature, and, like the ant-eaters, feed by thrusting out their long slimy tongue into the nests, and across the paths of ants and other insects; and indeed, from the ant-eaters properly so called, they differ in little except their scaly covering. They are natives of India and the surrounding islands, and consist of only three species. We notice two.

Spec. 1. *Tetradactyla.* Long tailed Manis, or Phatagin.—*Char.* Body long and slender; head small, snout narrow; tail twice the length of the body, tapering to a point; whole body, except the belly, covered with broad pointed scales: from the tip of the nose to the extremity of the tail five feet in length; feet four clawed. It is a native of Guinea.

Spec. 2. *Pentadactyla.* Short-tailed Manis.—This differs from the former, its tail being much shorter, very thick at the base, and terminating very obtusely; and also from its being of a much shorter and thicker form. From the excessive hardness of the scales, the inhabitants of Bengal call it the thunderbolt reptile, and although they dispatch it with the blows of a club, its scales are said to be capable of resisting a musket-shot, and often strike fire with a flint. The flesh of this animal is considered as very delicious.

Genus 4. *Dasypus.* Armadillo.

Char.—Grinders several; cutting and canine teeth none, body crustaceous, divided into moveable zones round the middle.

There are several varieties of this tribe, which have received their name from the strong shelly armour with which their bodies are defended. The coverings of the armadillos vary so much in the several species, that it would be extremely difficult minutely to describe them, as they are composed of several bands, differing much from each other in the arrangement of the figures which they exhibit, and by which they are distinguished. In general, there are two large pieces which cover the shoulders and rump, between which are regular bands folding one over another, not unlike the flexible parts of a lobster, which accommodate themselves to the animal's motions, and vary in number according to the species to which they belong. The armadillo is perfectly harmless and inoffensive, burrows deep in the ground, seldom leaving his retreat till after sunset, when he ventures abroad in search of food. He lives chiefly on roots, fruits, and other vegetables; is likewise fond of worms and insects, and when fat is esteemed excellent food. He is found only in South America, and is hunted with small dogs by the Indians, or taken by snares laid for him in the places he frequents. The moment he perceives himself attacked, and sees no other chance of eluding his enemies, he brings his head under his shell like a snail, draws himself together, and having united the extremities of the head and tail, he presents to his opponents a callous ball, on which no impression can be made; and in this posture rolls himself over a precipice, by which means he generally escapes unhurt. Whenever an enemy appears, he either flies to his hole, if within his reach, or with his fore-feet digs a new one; and such is the astonishing power of his claws, that, if seized by the tail in making his way into the ground, he will force himself forward and leave it in the hands of the hunter.

Spec. 1. *Sexcinctus,* Six, or Yellow-banded Armadillo.—*Char.* Tail long, thick at the base, and tapering to a point; has a few scattered hairs between the folds of his shells, and is of the size of a young pig. This species is generally found in Brazil and Guiana.

Classification

Besides this there are several varieties. The *kabassou*, or twelve-banded armadillo, is the largest of all the race, and is about three feet long; the *weazel-headed* armadillo has eighteen bands from shoulder to tail, is about fifteen inches long, and is so called from the form of the head. The *tricinctus*, or three-banded armadillo, considered the most elegant of all the varieties, is about a foot long. On the head, back, and rump, the shells are divided into a number of beautiful raised figures with five angles or sides, and the zones of the body are extremely distinct. The legs are also covered with similar divisions of smaller size. This species of animals is extremely prolific, breeding four times a year, and producing several at a birth.

Genus 5. *Rhinoceros.*

Char.—Tusks none; grinders flat; sometimes front teeth similar to the incisors of other mammiferous animals; horn on the nose hard and conical; head large; ears long and erect; eyes deep-seated, small, and without vivacity; legs short; feet three-toed, and three large hoofs; tail short.

In strength and power this animal is exceeded by none, and, with the exception of the elephant, is the largest of all the quadrupeds. His usual length, exclusive of the tail, is twelve feet, and the circumference of his body is nearly equal. Of a heavy unshapely form, with a dark brown, naked, and wrinkled skin, covered with large callous tubercles, hanging round his neck in folds, he looks as if enveloped in a coat of mail. His nose is armed with a solid horny substance, constituting a weapon of defence, and with this he can protect himself against the most powerful adversary. To the tiger he is a more formidable opponent than even the elephant himself, and scarcely any animal can venture to attack him without risk of having his bowels torn out. When provoked, he exhibits the most dreadful paroxysms of rage and madness, so that he cannot be approached without the most imminent danger. Such is the thick and hard consistence of his skin, that it was formerly supposed proof against the sharpest weapon; but from the accounts of later travellers, it appears that, without much difficulty, his skin can be pierced by a javelin, and that a musket-shot will go through him, if not obstructed by a bone; nay, that he has been even killed in Abyssinia, by the arrows of the native tribes. His upper lip, which is long and very flexible, overhangs the lower considerably, is capable of great extension and contraction, like the proboscis of the elephant, and serves the purposes of grasping the shoots of trees and other substances, collecting his food and conveying it to his mouth. His legs are short and very strong; his belly formed like that of the hog; his tail short and slender, and covered on each side with tufts of bristly hair.

The rhinoceros is an animal of prodigious strength. With his horn he grubs up roots, tears up trees, raises stones, and throws them to a considerable distance behind him; and it has been observed by the Roman poet, that with this powerful instrument he can toss up a bull with as much ease as he would a foot-ball. Among naturalists it has been disputed, whether his tongue is soft or rough, and whilst it has been maintained by some to be smooth, like that of a calf, others allege, that with this organ he can easily lick off the flesh from a man's bones. The probability is, that the asperities are only to be found in the tongue of the rhinoceros when he is full grown. This animal is fond of solitude, frequenting the banks of rivers and marshy grounds; and when he is harrassed by insects, like the hog, he takes pleasure in rolling himself on the mud. From the peculiar construction of his eyes, it seems as if his sight were defective, so that he can only perceive those objects that are nearly in a direct line before him. His hearing, however, is extremely acute, and his sense of smelling so exquisite, that the hunters in pursuit of him carefully avoid going to windward, and always keep at a distance till they can discover that he has laid himself down to sleep, when they advance with the utmost precaution, and discharge their muskets all at once into his most vulnerable parts.

Order II.

The rhinoceros is an inhabitant of Bengal, Siam, and other countries of Asia, and is also found in the surrounding islands, and at the Cape of Good Hope. He lives almost wholly on vegetables, and prefers thistles, shrubs, and the grossest herbs to the most delicate pasturage. He will likewise eat all kinds of grain, is particularly fond of the sugar-cane; and the devastation which he makes in cultivated fields, exclusive of what he consumes, is prodigious. It is supposed that the period of his life is about eighty years. The female brings forth only one at a time, and at long intervals, and goes with young about nine months. For the first four years after the birth, the rhinoceros does not exceed the size of a large dog, and even when two years old, his horn, which is slow of growth, is seldom more than an inch long; but when the animal is at his full growth, it is from three to four feet in length. The superstitious natives value it particularly as a cure for poison, as well as a remedy against several diseases. Although his limbs are short, he forces his way through the woods with great velocity, rushing on with irresistible power, and, by his weight and strength, causing the smaller trees to bend like twigs in whatever direction he proceeds. The flesh of this animal, and particularly that of the under part of the foot, is esteemed a great delicacy by the natives. The rest of his flesh is said to have something of the flavour of musk, and eats like tough pork.

Of the rhinoceros there are two kinds, the single and double-horned.

Spec. 1. *Unicornis.* Single-horned Rhinoceros,—characterised by having only one horn.

This species, although more rare than that of the double-horned African rhinoceros, is found in abundance about the Cape of Good Hope. The most recent account given of this animal is in Campbell's Travels in South Africa, undertaken at the request of the London Missionary Society, being his second journey in the interior of that country, and published in London 1822. After mentioning that two rhinoceroses came into the town of Moshow, and that the inhabitants killed them both, he says, "They brought also the head of one of them, which was different from all the others that had been killed. The common African rhinoceros has a crooked horn resembling a cock's spur, which rises about nine or ten inches above the nose, and inclines backward; immediately behind this is a short thick horn; but the head they brought had a straight horn projecting three feet from the forehead, about ten inches above the tip of the nose. The projection of this great horn very much resembles that of the fanciful unicorn in the British arms. It has a small thick horny substance, eight inches long, immediately behind it, which can hardly be observed on the animal at the distance of a hundred yards, and seems to be designed for keeping fast that which is penetrated by the long horn; so that this species of rhinoceros must appear very like a unicorn when running in the field. The head resembled in size a nine-gallon cask, and measured three feet from the mouth to the ear, and being much larger than that of the one with the crooked horn, and which measured eleven feet in length, the animal itself must have been still larger and more formidable. From its weight, and the position of the horn, it appears capable of overcoming any creature hitherto known. Hardly any of the natives took the smallest notice of the head, but treated it as a thing familiar to them. As the entire horn is perfectly solid, the natives, I afterwards heard, make, from one horn, four handles for their battle-axes. Our people wounded another, which they reported to be much larger." In a note, it is mentioned, that, since the arrival of the skull in London, this animal is considered by naturalists to be the unicorn of the ancients, and may be seen at the Missionary museum. For a drawing of it see Plate 114.

After all, it is perfectly possible that this may be a species of the double-horned rhinoceros, whose smaller horn was not fully grown on account of its being young. The horns of these animals undoubtedly must assume different appearances according to their age, so that at one period of life they may have a more unicorn appearance than at another. But be this as it may, there is every reason to suppose that this is the unicorn alluded to in the sublime description given in the book of Job, as he possesses all the power, swiftness, and ungovernable rage ascribed to that animal. The rhinoceros was known both to the Greeks and Romans at an early period. Seneca mentions that Pompey the Great, in one of his public spectacles, produced one of them; and we are also informed that Augustus exhibited a rhinoceros on his triumph over Cleopatra, which was the first time that any of them was seen at Rome. Martial also has an excellent epigram on one of them, which, in the presence of Caesar Domitian, tossed a bull in the air with his horn like a tennice-ball:

> " O quam terribiles exarsit pronus in iras,
> Quantus erat cornu, cui pila Taurus erat."

The existence of the real unicorn has with some naturalists been considered as uncertain, although of this there can be no doubt, as there are frequent allusions to this animal in the Old Testament Scriptures. In the 92d Psalm and 39th of Job, this animal is distinctly named; and, in the Septuagint translation of the 33d of Deuteronomy and 34th of Isaiah, it is translated unicorn. According to Rabbi Solomon, David Kimchi, and Saadius, *reem* and *raras* are always translated *unicorn*; and they derive *reem* from *rom*, signifying *altitudinem, height*, as the horn of the unicorn is lifted up on high. The Greeks call it *monokeros*, and hence Pliny, and all the ancient grammarians, term it *monoceros*; but the most learned divines have adopted the Latin name, *unicornis*. Strabo and Aristotle state, that, in India, there are horses which have hart's heads with one horn, and cloven footed, and the unicorn which Pliny and Ælianus describe, is nearly in the same terms. Pliny says, the Arcean Indians hunt a certain wild beast, which " is very curst, untameable, having one horn, which in the head resembleth a hart, in the feet an elephant, in the tail a boar, and in the residue of the body a horse; the horn about two cubits long, and the voice like the lowing of an ox, somewhat shrill, and they deny that this beast is ever taken alive." Ælianus states, that " they have one black horn growing out betwixt their eye-brows, not smooth, but rough all over with wrinkles, and the same groweth to a sharp point;" but Gesner thinks this description is applicable in most if not all these respects, to the wild ass, except in the feet and colour; some, however, are of opinion, that the unicorn of the ancients, and that which Aristotle and Pliny have described, is nothing else than the oryx; and Scaliger, if he can be relied upon, states, that the wild ox in Ethiopia hath but one horn in the midst of his forehead, above a foot in length; but so fabulous are many of the descriptions given of the habits and qualities of this animal by ancient writers, and of the virtues ascribed to the horn, in resisting the effects of poison and prolonging life, that they appear quite incredible, and cannot be relied on.

Dr Parson states, that one of these animals was brought from Bengal into England in the year 1743, and although he was then only two years old, the expense of his voyage, including food, amounted nearly to L.1000. One of them, however, was afterwards purchased for the menagerie of Exeter Change, by Mr Pidcock in 1790, for L.700, and it is stated that he usually consumed twenty-eight pounds of clover, as much weight of ship-biscuit, and a great quantity of greens, every day; that he was likewise allowed a great proportion of water two or three times daily.

Spec. 2. *Bicorni*. Double-horned Rhinoceros.—In many particulars this animal resembles the former, and the chief difference consists in the two horns, one smaller than the other, and placed higher on the front, and in the appearance of his skin, which, in place of being covered with armour like folds, has only a small wrinkle across the shoulders, and on the hinder parts. These horns are said to be fixed only when the animal is in a state of rage or excitement; but at other times they are loose. So extremely rare is the double-horned rhinoceros that his existence was long disputed, and by some naturalists considered merely as fabulous, till one of them was discovered by Dr Sparrman, at the Cape of Good Hope, and which, previous to his account, had never been accurately described. This, however, is supposed to be the species employed in their public exhibitions, and is said to be found in several parts of Africa. The account which Mr Bruce, the

Abyssinian traveller has given us respecting the habits of the two-horned rhinoceros, is peculiarly interesting. Speaking of the manner in which this animal feeds upon trees, he observes that, with his upper lip and the assistance of his tongue, he pulls down the upper branches which have most leaves, and these he devours first. Having stripped the tree of its branches he does not immediately abandon it; but placing his snout as low in the trunk as he finds his horns will enter, he rips up the body of the tree, and reduces it to thin pieces, like so many laths, and, when he has thus prepared it, he embraces as much of it as he can in his monstrous jaws, and twists it round with as much ease as an ox would do a root of celery, or any tender succulent plant.

When pursued, and in fear, he possesses an astonishing degree of swiftness, considering the unwieldiness of his body, his great weight before, and the shortness of his legs. It is not true, that in a plain he beats the horse in swiftness, for though a horse can seldom come up with him, this is merely owing to his cunning. He makes constantly from wood to wood, and forces himself into the thickest parts of them; so that the trees that are dead or dry are broken down as with a cannon shot, and fall behind him and on his sides in all directions; others that are more pliable or fuller of sap are bent back by his weight and the velocity of his motions, and restoring themselves after he has passed, like a green branch, to their natural position, they often sweep the incautious pursuer and his horse from the ground, and dash them with prodigious force against the surrounding trees.

This animal, when keenly pursued by the hunters, seldom turns his head, and therefore can perceive nothing but what is directly before him. He will not hesitate, however, when furiously pressed by his enemies, to attack the horse and his riders. The naked man then drops from the principal horseman, and whilst the rhinoceros continues the pursuit, his enemy gives him a fatal stroke, cutting the sinews of his leg in such a manner as to prevent farther resistance or escape.

Genus 6. *Elephas*. Elephant.

Char.—Tusks in the upper jaw very long, thick, and curved; inferior cutting teeth in the adult none; grinders on each side on both jaws, one; skin without hairs, and wrinkled; ears broad and pendant; pectoral mammæ, two; tail not long; hoofs five on each foot; nose terminating in a very long, flexible, and prehensile proboscis.

The elephant is the largest of all existing quadrupeds, and surpasses all terrestrial animals in size, strength, and sagacity. If not the most useful, he may at least be considered as one of the most wonderful animals in the creation. Uniting in himself the skill and foresight of the beaver, the dexterity of the monkey, and the sagacity of the dog, he adds to all these qualifications the advantages of amazing force, caution, and magnanimity, so that we may consider him justly entitled to the first place in the rank of quadrupeds. This wonderful animal is a native of India, and also abounds in the southern parts of Africa, particularly in the extensive regions between the river Senegal and the Cape of Good Hope. They are by far most numerous in Africa, and are found in the greatest numbers in the interior parts, near the sides of rivers, where there are vast forests, and where they are so fearless of man, that the savage inhabitants of these countries are forced to make their habitations under ground, to avoid the danger to which they are exposed. Near the Cape they are to be met with in herds of many hundreds, and are still more numerous in the vast regions of Monopotapa and other parts of the interior of Africa.

This animal lives to a great age, and when properly treated, even in a state of slavery and labour, he will reach to 130 years. He is thirty years old before he reaches full growth, and is supposed to propagate his species till 120, and in his natural state his life is often extended to the long period of 200 years. In those countries where they are so numerous, the natives kill them for food, and the trunk, particularly, is said to be extremely delicious. As the teeth of this animal, which are imported from Africa, are generally found in the woods; it is uncertain whether they are shed teeth, or those of animals that have died. The teeth imported from Mozambique are in length about ten feet, those of Malabar only four, but the largest are those of Cochin-China. The Chinese are said to consider the flesh, skin, and bones of this animal as possessed of medicinal qualities, and they often make use of them as a remedy against various diseases.

In eastern nations, elephants have from time immemorial been employed for the purposes of war; and Alexander the Great is said to have been the first European who ever ventured to mount one of these animals. Having transported a number of them into Greece upon his return, Pyrrhus afterwards employed them against the enemy at the battle of Tarentum. Since fire-arms have become the chief instruments of war, these animals are of little use in the field of battle, as, being so terrified by the flame and explosion of artillery, they are soon thrown into confusion, and become unmanageable,—thus tending to embarrass an army, and trampling down those very ranks which they were intended to defend. It is only, therefore, in those remote countries where fire-arms are little known, that they can be brought into the field of battle with any advantage. They are consequently now chiefly used for the purposes of labour, or employed for magnificent parade by eastern princes. They are likewise employed for the execution of criminals, which they accomplish by breaking, with singular dexterity, at the word of command, the limbs of the criminal with their trunks; and, in compliance with the order of their keepers, either prolonging his sufferings, or accelerating his death by trampling him under their feet. Hundreds of these enormous animals, magnificently caparisoned, are still employed by the despotic princes of Cochin-China, Siam, and Pegu, for the purpose of transporting their ladies and attendants through their dominions. In these countries some of them are milk white, of great value, and constitute one of the most pompous appendages of eastern magnificence.

In the management of this animal, the guide sits astride upon the neck, and the combatants, or other individuals, sit or stand upon the other parts of his body. The animal is urged forward by his conductor by means of a small rod of iron, pointed at the end and hooked; but this he seldom needs to make use of, as a word from the keeper is commonly sufficient to induce this intelligent creature to advance or perform whatever task may be assigned to him. When tamed, the elephant is the most friendly and obedient of all animals, and becomes extremely fond of his keeper, is attached to the person who feeds him, and often caresses him with his trunk. In the course of a few days he knows the sound of his master's voice and the signs by means of which he is to be directed. Like the dog, he can distinguish the language of passion, approbation, or command, and receiving his directions with attention, he performs them with care and alacrity. He bends his knees for the convenience of those who mount, and lowers his body, till he receives his load; nay often, with his trunk, assists those who are loading him, by lifting the burdens and laying them on his back. Delighting in the magnificence of his trappings, he suffers himself to be harnessed for the yoke. In carrying burdens, and in drawing waggons and various sorts of machines, he will do more labour than six horses, and can travel, without any violent effort, fifty or sixty miles a-day, but, in a case of emergency, even twenty or thirty more. He carries on his neck, back, and tusks, sacks and bundles of every kind, and will never lose or damage any thing with which he is entrusted. Stationed upon the brink of a river, he will take bundles off his neck and tusks, lay them cautiously in whatever part of the boat may be pointed out to him, and will try whether they be properly or securely placed. If loaded with casks, he will search for stones to prop them, or prevent them from rolling,—and is so attentive to the commands of his master, that a word or a look is sufficient to stimulate him to exert all his strength. These animals, it appears, are not only extremely tractable, but likewise possess a wonderful degree of intelligence, being not only sensible of benefits received, but of injuries, which they seldom fail to resent. One of them, which, in passing along the streets of Delhi, thrust his trunk into a shop where several tailors were at work, had been pricked by one of them with his needle; he passed on, filled his trunk with water out of the first dirty puddle, returned immediately to the shop, and spurted the whole of it upon the offender. The marquis de Montmirail states, that the conductor of an elephant having deluded the animal, with the false promise of a vessel of arrack, as a return for extraordinary labour, was, in the instant of rage and disappointment, destroyed by it; and the afflicted wife of the cornac, as the keeper is called, in a fit of agony, threw her two little infants at the feet of the infuriated animal, exclaiming, "Since you have destroyed my husband, kill me also and my children." The beast, as if stung with remorse, paused immediately, and taking up the eldest boy with his trunk, placed him on his neck, and would never afterwards obey any other governor.

About the Cape these animals are hunted for the sake of their teeth. Three horsemen generally sally forth in pursuit of them, and being well armed with lances, attack their victim alternately till he is subdued or put to death. Three brothers who had raised themselves to independence by this profitable business, before returning to Europe, resolved to have a last chase by way of amusement. At the commencement of the attack one of the horses unfortunately fell, and the rider was thrown to the ground without being able to recover his seat. The enraged elephant instantly seized the unfortunate man, tossed him up to a vast height in the air with his trunk, and received him on one of his tusks; then turning towards the other two brothers, as if gratifying his revenge, exhibited to them the impaled victim wreathing on the bloody tooth. Although the elephant is possessed of such prodigious strength as might seem to set all human power at defiance, yet man, by his superior sagacity, has been enabled to render him subservient to his purposes. Amidst the forests and places which the elephant frequents, the Indians select a particular place, and enclose it with strong palisades, interweaving them with large branches of trees, and one end of which enclosure is narrow, from which it gradually opens to a considerable extent. Upon this occasion, some thousands of hunters are employed to prevent the wild elephants from making their escape. The guide then proceeds with the female towards this artificial enclosure, making her repeatedly cry as she travels along. Having entered the enclosure, the wild elephants follow her, and no sooner do they enter this narrow passage, than the Indians immediately shut it up by strong bars. Whenever they discover the hunters, and that they are completely environed, their passion for the female is converted into rage and fury. They are then entangled with strong ropes, and bound with fetters on the legs and trunk, when several tame elephants are brought forward to reconcile them to their captivity, and, in the course of fourteen or twenty days, by the proper application of torture and caresses, they are brought to submission and obedience. They then become attached to the keeper, quietly resigning their prodigious strength to the service of man. Many other contrivances have been resorted to for catching elephants, and the poor Indians are content to adopt a very simple method, by digging deep pits in the paths which these animals frequent, and covering them over with trees, so that when the unwieldy creature falls into one of them he is incapable of making his escape.

The elephant about the Cape of Good Hope is of great magnitude, being from twelve to fifteen feet in height, and about sixteen feet in length, and the circumference of his body at the thickest part, when full grown, measuring about twenty-six. The trunk, or proboscis, properly speaking, is the nose extended and terminated by the nostrils through which he draws in water to quench his thrust, or to cool himself, which he frequently does, by spouting it over his whole body as if it issued from a fountain. It is about eight feet long; and in circumference near the mouth five and a half, but near the extremity only about eighteen inches. It is composed of membranes and sinews, and is the organ of feeling and action, as he can bend, contract, extend, and turn it in every direction. This tube, which is extended on the upper side, in the form of a finger, about five inches long, possesses most of the advantages of that useful member, and enables him to lay hold of his food or other substances, untie knots, and grasp any thing so securely that scarcely any power can force it from him. With as much dexterity does he manage this organ as a man does his hand, taking up grains of corn or the smallest particles of grass, and conveying them to his mouth. His two large tusks, which are of a yellowish colour, and extremely hard, have, by some, been considered as the horns of the elephant, and the bony substance of which they are composed is much used in various branches of manufacture, under the name of ivory. The largest tusks are about 150 lbs. Dutch, and are frequently sold for as many guilders. In proportion to his size, the ears of this animal, which are commonly pendulous, are much longer than those of the ass, and lie flat on his head, although he can raise them at pleasure and use them as a fan, either for cooling himself or defending his eyes from insects or dust. The elephant is said to delight in music, has a fine ear, and moves in cadence to the trumpet and other musical instruments. His skin, which is of a tawny colour, is wrinkled, uneven, and knotty, and has somewhat the appearance of the bark of an old oak-tree, having fissures in which there are some bristly hairs, which are also thinly scattered over his body. His legs are from 15 to 18 inches in diameter, have the appearance of massy columns, and are from five to six feet high. In his ordinary walk he is equal to the horse, and when urged to his full speed he assumes a kind of ambling pace which is equal in speed to a gallop. Though he proceeds with ease, he turns himself with difficulty, and is then forced to make a considerable circuit round. His neck is so short that he must wheel round before he can survey his enemy in the rear, and his legs are so stiff, especially when advanced in years, that he is obliged to repose himself standing. He swims with great facility, and carries large quantities of baggage over extensive rivers,—and when every other part of his body is below the water, he continues to breath by raising his trunk above the surface. Even in the savage state the elephant is peaceable and gentle, and seldom makes use of his power but in his own defence or that of his companions. Being of a social disposition, he is rarely found alone; and when troops of them assemble together, the oldest leads the van, the younger or lame ones occupying the middle station, and the rest walking in the rear. In this regular order, however, they seldom march, except upon hazardous journeys where they expect to meet with opposition. When thus collected, it is dangerous to offer them the smallest injury, as they can easily outrun the swiftest man, whom they seize with their trunk, toss in the air like a stone, or trample to death. Though extremely sensible of injuries, the elephant will never attack any person unless he be provoked; but travellers, to prevent their approach during the night, frequently have recourse to the use of fire-arms, beat drums, and kindle large fires around them,—and if once attacked, these powerful animals seize every opportunity of revenge.

The elephant subsists wholly on vegetables, feeding on roots, herbs, leaves, fruits, grain, and the tender branches of trees, and appears to have a natural antipathy to animal food. They commonly associate in numerous herds; and as soon as any of them discovers a plentiful pasture, he immediately gives a loud signal, and invites his companions to partake of his fare. From the large quantities of food these animals devour, they often require to seek for a fresh supply, so that, if they chance to stray into cultivated grounds, the havoc and desolation which they occasion by the enormous weight of their bodies, as well as by the quantities of the food they consume are prodigious. The negroes, therefore, make use of every possible art to keep them at a distance from their cultivated lands; but the precautions they make use of are not always sufficient to prevent their approach, for, as the whole herd generally advances together, they always act in concert whether they march, attack, or fly. They are scarcely susceptible of any fear, and the only thing which can surprise them or prevent their progress is artificial fire, such as squibs and crackers, the effects of which are so sudden, and so quickly repeated, that they frequently take the alarm and scamper off.

This extraordinary quadruped, though it has for many years been reduced to a state of subjection under the dominion of man, has been never known to breed in a domestic state; so that the princes of eastern nations are under the necessity of sending every year into the forests to obtain a fresh supply.

Those elephants that have been imported into Europe are commonly of a diminutive size; and it is well known that these animals never reach their full growth, nor their ordinary term of life, in a cold climate. One died in the menagerie at Versailles at the age of only seventeen years. At four years old he was only six feet and a half high, and never advanced above one foot more during all the time he lived in France, although he was kindly treated and fed with the utmost profusion. The one exhibited at Exeter Change, and which died in 1803, was purchased, by the owner of that menagerie, for L.1000. He lived chiefly on hay and straw, and seemed extremely fond of carrots, cabbages, boiled potatoes, and bread, but the quantity he consumed could not be precisely ascertained. Like all the rest of his kind, he was extremely tractable, and would, at the word of command, bow to the company, kneel down, or search the pockets of his keeper.

The teeth of the elephant have often been unexpectedly discovered in various parts of the globe. Part of the tusk of an elephant, and two grinding teeth, were found some years ago placed in a bed of gravel, at the depth of 42 yards, in a lead mine in Flintshire. The grinders had suffered little or no injury whatever, but the tusk was much decayed, and very soft. A large tusk was also lately found on the banks of the Almond, near Cliftonhall, a few miles west from the city of Edinburgh, in the excavation of the Union Canal. It was of considerable weight and thickness, fresh, and uninjured, and had been imbedded about 16 feet in the solid clay.

This specimen is still to be seen in the possession of Sir Alexander Maitland Gibson.

Tusks and teeth have been frequently dug up near the banks of several rivers of Siberia; which, although once supposed to belong to the mammoth, are now universally believed to be those of the elephant. If this animal has ever visited the cold regions of Siberia, he must have probably been carried thither for the use of the Tartar princes, the successors of Ginghis Khan. Similar discoveries have been made on the banks of the Ohio, in America, where the tusks, vertebrae, and other bones of prodigious size, have been found deeply imbedded under the surface. Specimens of these bones and teeth are now exhibited in the British museum, in the museum of the Royal society, and in that of the college of Glasgow. Fossil bones of a similar kind have also been found in many parts of Peru and Brazil, which in some respects differ from those of the elephant; but the species to which these bones are allied has never yet been discovered.

Of this genus there are at least two distinct species, besides the *mammonteus*, or mammoth of the antideluvian world, which has been considered as an entirely different race. Linnæus supposed there was only one species, which he therefore denominated *maximus*; but Cuvier mentions two, the *caponsis*, which is a native of the Cape of Good Hope, and the *indicus*, a native of India; and the same author not only notices the remains of the mammoth which have been found in a fossil state, but also that of the *Elephas Americanus*, or elephant of the Ohio. See MAMMOTH.

Spec. 1. *Capensis*. The Cape Elephant.—*Char.* Front teeth convex, and flattened behind; four grinders in each jaw, with crowns closely united in one compact body with the jaw bone.

Spec. 2. *Indicus*. Indian or Asiatic Elephant.—*Char.* Grinding teeth crowned, and formed of transverse parallel bands; ears broader than the former. The manners and habits of both these species have already been sufficiently detailed in the article above.

Genus 7 *Sukotyro.*

Char.—One horn on each side, near the eyes, which are placed vertically in the head.

Nienhoff is the only traveller who mentions this animal, of which there is only one species, and that very little known. He represents it to be of the size of a large ox, of a singular shape, with a snout similar to that of the hog, a thick bushy tail, and long and rough ears. On each side of his head, near to the eyes, are placed two tusks, or horns, little inferior in size to the tusks of the elephant. This quadruped is a native of the island of Java, and feeds on fruits and herbage.

Genus 8. *Platypos.*

Char.—Web-footed; mouth formed like a duck's bill, with two grinders on each side of the upper and under jaw. There is only one species, *anatinus*, or duck-billed platypus. Dr Shaw has given an account of this animal, which was presented to Sir Joseph Banks. It is a native of New Holland. In its outward form it has the appearance of the beak of a duck affixed to the head of a quadruped, while, in its bodily shape, it strongly resembles that of an otter, being covered with a short beaver-like fur, of a dark brown colour above, but whitish beneath. The tail is obtuse and flat, in length about three inches, the whole animal being about thirteen, and the beak an inch and a-half. On the hind feet the web reaches only to the roots of his claws, but on his fore ones, it extends considerably beyond them. This quadruped was first named *ornithorynchus paradoxus*; and, under this name, a description has been given of it by Blumenbach of Gottingen, and by Mr Home of London; and it appears to be similar to the fossil remains of the *ornithocephalus antiquus*. See *Animal Remains* under GEOLOGY, and Plate 93.

Genus 9. *Trichechus.* Walrus.

Char.—Fore teeth none, in the full grown animal; single tusks in the upper jaw, bent downwards; grinders flat, with a transverse line elevated in the middle; external ears none; lips double.

This animal is amphibious, and in its habits approaches nearer to the nature of fishes than to that of quadrupeds. It is generally included under the latter denomination, and may be considered as constituting one of those links by which quadrupeds and fishes are connected. Although the walrus and manati pass the greater part of their time in the watery element, they are also frequently found on shore. Sea-weeds and fish constitute their principal food. About seven species are enumerated.

Spec. 1. *Rosmarus*. Arctic Walrus, Morse.—*Char.* Two large tusks in the upper jaw, upwards of two feet in length; head round; lips very broad, and covered with pellucid strong bristles; eyes small and red.

This animal, called also sea-horse, is of a large size, sometimes about 18 feet in length, and at the thickest part 12 feet in circumference. His teeth, which are equal in durability to those of the elephant, and his fat, which is equal in quality to that of the whale, constitute his value. His skin is thick and wrinkled, with a covering of short brown hair; his upper lip is cleft into two large lobes, over the surface of which are numerous semi-transparent bristles, nearly three inches long, and almost equal to a straw in diameter; his legs are short, and on each foot five toes, with a small nail, connected by membraneous webs. His eyes are small, and he has two small orifices in place of ears, with semicircular nostrils, through which he spouts out water like the whale.

This species inhabits the northern seas, where large herds of them are often seen basking on the shore or sleeping upon the ice. On the least alarm they dash into the water, and should any of them be wounded, they become furious, and assemble in vast crowds together for their common defence, nor will they hesitate to attack a boat full of armed men, and endeavour to sink it, raising at the same time the most hideous cries, and gnashing their teeth with the greatest violence. Unless provoked or attacked, however, the walrus is extremely harmless. The female brings forth a single cub at a birth, about the size of a year old pig, and is said to suckle it upon land.

Classification

In getting out of the water upon the ice, the walrus uses his teeth as hooks to secure his hold, and draw up his unwieldy body, and with them also he scrapes shell-fish from the rocks and sand. His greatest enemy is the white bear, which he generally conquers, by means of the terrible wounds he inflicts with his teeth. Captain Cook states, that the female will defend her young to the last, at the expense of her own life, whether in the water or upon the ice; nor will the young one quit the dam though she be dead, so that, if one be killed, the other is made sure of. The walruses often sleep ashore, and snore with a loud noise. So numerous were these animals, about the year 1608, on Cherry isle, between Norway and Spitsbergen, that a ship's crew, in a few hours, killed several hundreds of them; but since that period their numbers have been considerably thinned, owing to the annual conflicts they are compelled to engage in with the northern fishermen.

Spec. 2. *Borealis.* Whale-tailed Walrus.—*Char.* Hairless; tail horizontal; skin, when wet, brown, when dry black.

This species chiefly frequents the mouths of rivers and shallow shores, and is found in the eastern seas beyond Kamtschatka and about Bhering's island. In flood-time they approach very near to the land, and in calm weather are often seen in great numbers swimming together. Without apprehension of danger, they often permit themselves to be stroked with the hand by the sailors; and, when wounded or hurt, they retire to the ocean. They seem to live together in families, the male and female, with a half-grown one, being always found together. Not only are the members of the same family thus united, but also several families of the same herd; and so great is their affection, that the male will defend the female to the very last; and should any one of them be harpooned, the rest of his companions fly to his assistance, and endeavour to overturn the boat, or strike out the instrument with their tail, which they often effect. They feed on the stems and roots of the larger fuci, of which they are extremely fond. Their blubber is in taste somewhat like that of the oil of almonds, of a yellow colour, and is sometimes substituted for butter, to which, indeed, it is little inferior, and it retains its sweetness for many months. When the animal is young, his flesh tastes like veal, but when full grown it is coarser than beef. The skin is frequently manufactured into shoes; and in its natural state is employed for covering the sides of boats. These animals are of enormous size, some being twenty-eight feet long, and weighing 8000 pounds, so that, when harpooned, they often require the strength of thirty men to land them on shore.

Spec. 3.—*Australis,* or Round-tailed Walrus.—*Char.* Hairy, with a horizontal tail, but no feet.

This species is to be found between the Cape of Good Hope and the Philippine isles and on the coast of Sumatra. The tusks are of superior whiteness, and used for the handles of knives and Indian daggers. The food of these animals consists chiefly of a green sea moss, growing in great abundance on the shores. But their habits and figure are imperfectly known.

Order III.

ORDER III. FERÆ.

Char.—Fore teeth conical, usually six in each jaw; one canine on each side; feet digitated, and armed with sharp claws; claws subulate. This order includes ten genera.

Genus 1. *Phoca.* Seal.

Char.—Six upper cutting teeth, four lower, and equal tusks on each side, strong and pointed, upper remote from the fore-teeth, the lower from the grinders, which are locked, and have a sharp crown; grinders on each side five above and six below, tricuspidated. There are nineteen species.

Seals often frequent the sea-shore, and bask themselves on insulated rocks. Like the walruses, they seem more properly to belong to the marine tribe of animals, and are most numerous in the frozen seas, where vast numbers of them assemble together, especially at the time of parturition, when they are to be found almost on every shore. Their skins are of considerable value, and their flesh, which is of a fishy taste, is tender and succulent. They live chiefly on sea-weed and fish, and, to allay the keen sensation of hunger, often distend their stomachs with stones when they cannot procure food. Although they generally live in the water, they likewise find it necessary occasionally to repose themselves on land or on rocks, which they are enabled to climb by means of their sharp claws.

Spec. 1. *Vetulina.* Common Seal or Sea Calf.—*Char.* Without ears; colour brown; head and neck smooth; length from five to six feet.

The common seal is to be found on most of the rocky shores of Great Britain and Ireland. It inhabits all the European ocean, and even about the regions of the south pole; and, according to Mr Pennant, they are sometimes to be found in fresh water lakes. To remove themselves from the reach of the tide, they generally retire to hollow rocks and caverns of the ocean. They are dexterous divers, swim with great velocity, and often bask in the sun on large stones or rocks on the shore. When at any time alarmed, they fly with the utmost precipitation to the water, throwing stones with their feet behind them as they scramble along, and all the while moaning most piteously, and, when seized, defend themselves with the utmost vigour. They are taken chiefly for their skins and oil. The female produces two at a time, which are covered with a whitish down, and the growth of the young ones is very rapid. Owing to their dexterity in swimming, they are excellent fishers, it being difficult for the weaker fishes to escape them, unless by getting into shallow water. A young seal can be so tamed as to come to his master when called, and follow him like a dog.

The most proper time for hunting seals is towards the end of October or beginning of November, when the hunters cautiously enter the mouths of the caverns about the middle of the night, and land with as little noise as possible. As soon as they are properly stationed, with heavy bludgeons in one hand and torches in the other, they set up a hideous noise, to alarm the seals in the distant parts of the cavern, which hurry down with the utmost precipitation and confusion from all quarters, making frightful cries. As they at length assemble together with dreadful impetuosity, near the edge of the water, driving every thing before them that opposes their progress, the hunters are often exposed to the utmost hazard of being borne headlong by the throng. Their great object is, in the midst of this confusion, to kill as many as possible with their clubs; and they are generally most successful in their attacks upon the stragglers and the young ones, whom they put to death by a stroke on the nose.

Spec. 2. *Barbata,* or Great Seal.—*Char.* Teeth like those of the former; long white whiskers with curled points; ears none; back arched, black, and almost naked in summer.

This species is upwards of twelve feet in length, whereas the former, when full grown, is only six. The Greenlanders use the skin of them for thongs and lines; and the flesh, which is white as veal, is esteemed the most delicate of any. They produce a considerable quantity of lard, but little oil, and are chiefly to be found about Greenland, where they commonly rest on the floating ice.

Genus 2. *Canis.* The Dog.

Char.—Cutting teeth six in each jaw, the upper lateral ones longer and distant, the lower lateral lobated; tusks solitary and incurvated; grinders six, seven, or more than in the other genera of this order. About twenty-three species have been enumerated.

The dog, being carnivorous, commonly tears what he eats, and prefers those bodies which have been sometime exposed, and which are tainted, or which require to be unearthed, to food that is recently killed and fresh. In their wild state these animals go in large packs, attacking almost every creature that comes in their way, and, from their number, are enabled to overcome many wild animals which, separately, are more ferocious and more powerful than themselves. They often burrow under ground like the fox, if they cannot discover some convenient cleft in the rock, or some den in the forest, already prepared for their reception. Like most animals of prey, they take their repose in the day-time, and come abroad to prowl for plunder soon after the going down of the sun. They often drive the flocks and herds into corners where they are unable to make their escape, when they attack them with fury, and kill more than they are able to devour; and so rapacious are they when they have fasted long, that some of the fiercer species will not hesitate to make war upon man. In warmer climates the voracity of this animal is even favourable to the health of the human race, as multitudes of them roam about in search of carcasses left exposed, and the effluvia of which would generate disease and death.

But although in his savage state the dog is a dangerous enemy to other animals, being of an irritable and ferocious character, yet, when domesticated, his principal aim seems to be to please his master, so that he is equally remarkable for his docility, fidelity, and attachment, and seems to have been intended by nature as the assistant and companion of man. To enable man to defend himself against the attacks of other animals with which he is surrounded, and to subdue such of them as might be useful in domestic life, it was necessary for him to select some one to assist him, and amongst all the animals with which he is surrounded, none appears to be so peculiarly adapted for this purpose as the dog. This animal seems always contented to accommodate himself to the manners and habits of those with whom he lives and associates, and he does so with a humble acquiescence and facility which are truly admirable. His suspicions are perpetually alive, and his watchfulness over whatever is entrusted to his care, is equalled only by his courage in its defence; so that his inferences and apprehensions, with respect to the conduct and actions of strangers, are wonderfully judicious and correct. Qualities of this nature render him peculiarly valuable to our species. When he shares of his master's power and authority, he seems conscious of his own importance, and exerts a superiority over other animals that are entrusted to his protection.

Familiaris. Familiar, or Common Dog.—*Char.* Tail curved, and turned towards the left; upper part of the head flat, and snout lengthened; claws long and curved.

This animal, commonly termed the Shepherd's dog, is considered by some naturalists as the parent stock of the canine race. This species has one and sometimes two toes more than most of the other varieties. They hang at the hind part of the leg, somewhat like an excrescence rather than an essential part of the foot; and this likewise has been observed both in the cur and spaniel. In the northern parts of Scotland, the genuine breed of this animal is considered extremely valuable, and the shepherds are at the greatest pains to preserve it pure; but about the Alps, and some other regions of Europe, this species is considerably larger and stronger than in Britain.

Wherever lofty mountains, or extensive tracts of land, are wholly set apart for pasturage of sheep and other cattle, the services of this faithful animal are extremely valuable. He knows the voice of the shepherd, and is so attentive and obedient, that, when so far distant that the sound of the voice cannot reach him, he will promptly, and on the smallest signal, execute his commands; so that, in collecting the flock together, or removing them from one place to another, or in preventing them from straggling, the assistance of one of these animals, when well trained, is of greater use, and more effectual than all that could be accomplished by several men, independently of the fidelity with which, in the absence of the shepherd, he guards the flock entrusted to his charge.

The female produces several at a birth, which, from a membrane uniting the eyelids, are blind for nine days, and in some other respects but imperfectly formed. They arrive at their full size in about 18 months, and live from 12 to 18 or 20 years.

Cur-Dog.—Although this is not generally looked upon as a distinct race, yet he is much esteemed and extremely useful to the farmer and grazier, so that in the north of England the greatest attention has been paid to the breed. In driving cattle they are particularly useful, and surpass the shepherd's dog in size, fierceness, and strength. The cattle can make no resistance against them, as they always attack the heels, and bite very keenly. Some of them are extremely sagacious, can distinguish those that belong to their master, and watch over whatever cattle are pasturing in his inclosures, so that they can go their daily rounds of their own accord; and, whenever any strayed cattle have got among the herd, they will immediately attack them and drive them out of the field.

Greenland Dog.—The greater part of this species of dogs are of a white colour, although some of them are black and others spotted, and instead of barking they may be said to howl. The Siberian, Lapland, Iceland, Pomeranian, and wild American dogs, are all somewhat similar to this species, and particularly in the acuteness of their muzzles, shaggy hair, and bushy curling tails, and in their general appearance they are somewhat similar to the shepherd's dog, but are larger in size. The Greenlanders make use of their skins for garments, and sometimes eat their flesh, and the larger ones they employ in drawing sledges, yoking four, five, or six of them together at a time.

In the neighbourhood of Kamtschatka, the dogs are somewhat similar, not only in their colour, but also in their strength and activity, and are commonly used in winter in drawing sledges; and a late traveller, Captain King, relates, that a courier drawn by dogs performed, in less than four days, a journey of 270 miles. To enable us to form an idea of the fleetness of these dogs, the same traveller states that he was informed by the commander of Kamtschatka, that he had once received an express from Bolcheretsk in 24 hours, although the distance be not less than 130 miles.

When these dogs are harnessed, the foremost or leader has the reins attached to his collar, and the driver, by his voice, urges them forward; but should they be inclined to resist, he has nothing more to regulate their motions and speed than a crooked stick, which he makes use of by occasionally striking on the snow, or by throwing it at their heads; but this he does as seldom as possible, because, if he should fail to recover it, they might immediately run off, overturn the carriage, or dash it to pieces. Mr Lessop represents this mode of travelling as very expeditious, although at the same time very troublesome, both on account of the refractory disposition of the dogs on long journeys, and from the howling they make in the night, which renders it impossible for the traveller to enjoy the smallest repose. But without these dogs the inhabitants of Kamtschatka would feel themselves in a most comfortless situation.

In 1784 one of these dogs was left on the coast of Northumberland by a smuggling vessel, and, having no means of support, he felt himself under the necessity of betaking himself to the worrying of sheep, and at last became the terror of all the country around him, so that the shepherds and farmers were at last obliged to use every means in their power to effect his destruction. To accomplish this they frequently made use of greyhounds and other dogs; but as soon as they approached him, he threw himself upon his back, as if intreating their mercy, and in this situation not one of them would touch him. Resting himself thus quietly till the hunters came up, he again set off, but without being followed by one of the dogs, till they were again urged forward by the hunters; so that in this manner he continued, for a long time, a most harrassing and troublesome neighbour; and such was his strength and fleetness, that one day he was hunted from Howick to a distance of upwards of thirty miles, and returned to the same place on the same evening to satisfy his hunger. During the day he took his station upon the summit of a rock near Howick, where he had a perfect view of four different roads that approached the hills from which he was accustomed to descend in the evenings for the purpose of plunder; and after all the neighbouring districts had amused themselves, and by many fruitless efforts endeavoured to destroy or secure him, he was at last shot in 1785.

The *Bull-Dog* is considered as the most courageous of all animals, and is extremely fierce. Although not the largest of the race, he is possessed of great muscular strength, has a very short nose, a projecting under jaw, and, on the whole, a terrific and savage aspect. He will not hesitate to attack any animal although double his strength and size, and his courage in seizing the bull, as well as his obstinacy in keeping his hold, are extremely surprising. Conscious of his irresistible power, if he can once obtain a proper hold, he always endeavours to fasten upon the front, and to seize the lip, the tongue, the nose, or the eye, from which no effort that can be made will disengage him. A shocking experiment was tried some years ago, by a young man in the north of England, with a view to exhibit the courage and prowess of his dog. For a small wager he undertook, at different times, to cut off its four feet, and that, after each foot was struck off, it would continue to attack the bull; and in this shocking experiment he actually succeeded. Till of late years, this barbarous custom of bull-baiting appears to have been very common. We learn, from the surprising account given by Elian of the dogs of Epirus, also noticed in the history of this animal by Dr Goldsmith, that this inhuman custom prevailed in the earliest ages, and it is only within these few years that bull-baiting has been almost entirely abolished in the north of England. The breed of this animal is now very rare; and it is much to be desired that it were totally extinct, as he is a most dangerous animal: always attacks without barking, and ought never to be approached by a stranger without the utmost precaution. The bull-fights in Spain and England are now, to the credit of humanity, almost totally discontinued; and it appears rather surprising that so savage a custom should have so long prevailed in any country where the light of reason and science are so widely diffused.

English Mastiff.—The genuine breed of this kind, although not entirely lost, is now but seldom to be met with, and most of the dogs of this species appear to be a mixture of the ban-dog, bull-dog, and Danish mastiff. The real breed is of a much larger size, and is far more powerful than the bull-dog; his ears are larger and more pendulous, his lips thick and hanging over his under jaw, his countenance sullen, and his bark, from the loud tone of his voice, peculiarly deep and terrifying. He is chiefly used for guarding houses, gardens, and property against thieves and robbers, especially in country places, where he is ever faithful to his trust, and will suffer no depredation to be committed on the property where he resides. Like a trusty watchman he goes his rounds, and frequently barks to give notice that he is ready to defend the premises.

At one period the English mastiffs were so much esteemed in the Roman amphitheatre, for their invincible obstinacy in fighting, that one of the emperors appointed an officer to reside in England to attend to the breed of these animals, and to send to Rome such as were considered properly qualified for these exhibitions. In those days, according to Dr Caius, three mastiffs were considered as a match for a bear, and four for a lion; but the experiment being tried in the tower of London, in presence of James I. it appeared that the lion was not an equal match for three of them. This engagement has been recorded by Stow, who states, in his Annals, that one of the dogs being put into the den, was soon disabled by the lion, which took him by the head and neck and dragged him about. Another dog was then let loose and served in the same manner; but the third being put in, immediately seized the lion by the lip, and held him for a considerable time, till being severely torn by his claws, the dog was obliged to quit his hold, and the lion, greatly exhausted in the conflict, refused to renew the engagement, took a sudden leap over the dogs, and fled into the interior part of his den. The pure breed of this race will fight to the last extremity, and be cut in pieces and die, rather than yield. The forbearance of the mastiff, however, under injury, when offered by an unworthy antagonist, is so great, that he has been known, when teazed and molested by a little mongrel on board of ship, to take no other revenge than lifting up the offender in his mouth and composedly dropping him overboard.

The *Ban-Dog* is only a variety of the above species, but of smaller size; and, although more vigilant, is not so powerful. In his sense of smell he approaches nearer the hound; is of a yellow-grey colour, mixed with streaks of black or brown. He is quick in his attack, and bites keenly, and as frequently seizes the flank as the front of his adversary.

Dalmatian or *Coach Dog*, by some considered as the leopard-spotted, or small Danish dog. This dog is seldom used in this country for any other purpose than attending a carriage; and, by way of improving his beauty, he is generally compelled to submit to the cruel practice, which almost universally prevails, of depriving him of his ears. Count de Buffon has erroneously supposed him to be the harrier of Bengal, as he is utterly destitute of the capacity of scenting; and he is very frequently also taken for the small Danish dog, which Daubenton seems to consider as a distinct breed. The leopard, or small Danish dog, was always most valued when spotted like a lynx; and Aldrovandus says its name was *beachus:* and hence Buffon has called it *braque de Bengal*; and Caius affirms, that the blood-hounds of Scotland were called *rachis*, as the hunting dogs were called *brachis.*

Irish Greyhound.—This variety, once very frequent in Ireland, and made use of in pursuing the wolf, is now very scarce, and commonly kept more for show than for use, being totally unfit for hunting. He is most beautiful and majestic, and the largest of the canine species; some of them, according to Dr Goldsmith, being four feet high. In Buffon's opinion, these greyhounds resemble the great Danish dog in form, although vastly more powerful, and far superior in the contest, either to the bull-dog or the mastiff; so that, when they can lay hold of their adversary by the back, they are enabled, by means of their great strength and size, to shake them to death. They are far, however, from being quarrelsome, possessing all the mildness of disposition which they so strongly indicate in their face. The great Danish dog is supposed to be only a variety of this species. In 1790, Lord Altamont had eight of these dogs in his possession; but Mr Lambert describes them as much degenerated. The largest was 61 inches from the muzzle to the point of the tail, and the height, from the toe to the top of the foreshoulder, 28 inches and a half. These dimensions, compared with Daubenton's measurements of the dog, show a great resemblance between this and the great Danish dog.

The Highland Greyhound or Wolf-Dog.—This dog, formerly used by the chieftains of Scotland, is now very rare. He accompanied them in their grand hunting parties, and is a large powerful animal, with wiry hair of a reddish colour mixed with white, and having pendant ears. The gaze-hound was somewhat of the same kind, and pursued only by the eye; and his race is now extinct, although formerly he was much valued for his services in pursuit of the fox, hare, and stag. From the herd he could select the fattest deer; and although, in pursuit, it should mingle with the rest, he would unerringly continue the chase, and run it down.

The *Lyemmer* is a mixed breed, which, in its shape, resembles the greyhound, and which hunted both by the scent and the sight; and obtained its name from being led in a thong to the field, and slipped at the game.

The Greyhound.—This is the swiftest of the dog race, and continues the pursuit only by the eye. His swiftness is supposed to be increased by using oil in his drink, or by eating raw eggs. He can outstrip every other animal of the chace; and he is supposed to be the Irish greyhound or wolf-dog, improved by the climate, and rendered more delicate by management: and it is obvious, that from the depth of the chest, and delicateness of the legs and muzzle, his resemblance to that species is very remarkable. It is said that the noblest kind of greyhounds keep at home, except when led out, and seldom bark. To give them wind and stretch their necks, the Lacedæmonians placed their food in a hollow place or pit, which produced the desired effect. By the forest laws of king Canute, no person under the degree of a gentleman was permitted to keep any dog of the kind. The Italian greyhound is of the same species, and in all respects similar in his appearance. Although not above half the size, he is inferior to none in the elegance of his form; but this country is too cold for his delicate constitution.

The *Lurcher* has obtained his name from his cunning habits; and although stronger in the limb, is shorter than the greyhound. He has generally a sullen countenance, is covered with rough yellowish hair, and is a keen hunter by the scent. So dexterous was this species in killing hares and rabbits when feeding during the night-time, and so often were they employed in this destructive and illegal practice, that they have been proscribed, and the breed is now almost extinct. When taken to a warren, even in the dark, they scent the rabbits, watch their motions, dart upon them without the least noise, kill them, and carry them to their master, who waits at hand to receive them.

The *Tumbler* likewise derives his name from his cunning manner of seizing game. After tumbling about in a careless manner, as soon as he is within reach he suddenly springs upon his prey.

The *Terrier* is the companion of fox-hounds, possesses an acute smell, and is extremely active in forcing out of their coverts, foxes and other wild animals. He is the bitter foe of every kind of vermin, is extremely hardy, fierce, and keen, and is generally more than a match not only for the weazel and foumart, but also for the badger. Of these, however, there are two kinds, the one generally of a yellowish colour, or black mixed with white, very strong, with long black and short legs; the other more delicately formed and more lively, with a shorter body and smooth hair, black or reddish brown, with tawny legs, less in size and strength, but similar to the other in courage and fierceness. When the breed of this useful little animal is pure, the palate or mouth within is black.

The *Beagle.*—Of all the dogs of the chace in this country the beagle is the smallest, and is never used for any other purpose than hunting the hare. It possesses an exquisite and delicate scent, by which it is enabled to pursue that animal through all her various windings, till she becomes at length entirely exhausted.

The *Harrier* differs from the former in being considerably larger and more active. It pursues its prey with most ardent keenness, and scarcely allows her a moment to breathe; and it requires considerable activity in the best mounted sportsman to keep up with the pack. The music of these dogs is peculiarly delightful to the true sportsman, as they proceed on full cry, the harmony of their voices contributing greatly to the pleasures of the chace.

The *Fox-hound.*—Britain excels all other countries in the world for the breed of fox-hounds, not only in their swiftness, but also in their great strength and perseverance. Even in the climate itself there seems to be something congenial to the nature of this race of animals, as they are known speedily to degenerate when imported into France, or indeed into any other foreign country, so that the qualities for which they were originally so admirable are speedily lost; and this will be matter of less wonder, when we consider that in no part of the world is their breeding, training, and management so much attended to as in England. With the healthy and the young, the amusement of the chace forms a striking trait in the English character, and this propensity is indeed so prevalent and so powerful, that it must cease to be matter of surprise that the English horses and dogs should be superior to every other in the sports of the field. The best dogs of this breed are those generally that are strong, tall, and slender made, and which are the most remarkable for speed, courage, and agility, as dogs of this kind possess all the qualities for hunting the stag, deer, or other animals of the chace. Numerous anecdotes have been related in the Sporting Magazine, and other similar works, of the wonderful spirit and exertion displayed by these animals in the field, some of them having continued in the pursuit not less than a hundred miles. The old English hound, which was perhaps the original breed in this island, and used in early times for the larger kinds of game, was chiefly valued for his great size and muscular strength. He was distinguished by his deep chest, long and sweeping ears, and the mellow tone of his voice. This breed, which has been reduced in size to increase his speed, is now almost totally extinct. There was also another variety of this kind, named the kibble-hound, being of a mixed breed between this species and the beagle.

The *Blood-hound*, a noble animal, and beautifully formed, was in great repute in Scotland in ancient times; and being superior to almost every other kind in sagacity, was, from his exquisite scent, generally employed in tracing and recovering the wounded game. This breed was formerly much used in those districts of the country that were infested with robbers and murderers, in barbarous times, and especially in the frontiers between England and Scotland, as they could follow to a great distance the footsteps of any thief or murderer that had fled, and could trace and discover him in his most secret retreats. Hence, in Scotland, the inhabitants were burdened with a certain number of these dogs under the name of sloth-hounds, and a law was enacted declaring any person an accessary who should deny admittance to one of these dogs in quest of stolen goods. Some of the original breed of these animals are still used in the southern parts of Britain, for the pursuit of deer that may have been wounded, or the discovery of deer-stealers, whom they can trace to a certainty by the animal's blood. Some of them are still preserved in the convents in the remote districts of Switzerland, not only for protection to the inhabitants, but also for discovering the bodies of travellers that may have died in crossing these lonely wilds. This animal seldom barks unless in pursuit of his prey, and his colour is generally reddish or light brown. An author of the 15th century, Conrad Gesner, received from the dean of Glasgow a fine figure of the Scottish blood-hound, which Hector Boece affirms to have been of a red colour, or black, with small spots; and the celebrated Mr Boyle, speaking of the acuteness of the smell of the Irish hounds, also mentions, in his treatise on air, that the English blood-hound could, to a certainty, trace the footsteps of a man several hours after he had passed. Strabo mentions, that these animals were made use of in ancient times by the Britons, in carrying on war with the Gauls; and there can be no doubt that, after the conquest of America, the Spaniards made use of them for the destruction of the inoffensive natives. Columbus, indeed, carried a considerable number of these animals to assist him in the conquest of St Domingo in 1422. Subsequent to this period, also, they were used by the French against the revolted negroes of that island; and some of their captives, it has been alleged, have, in cold blood, been exposed by them to the fury of these animals to be torn asunder and devoured. It is scarcely to be believed that these blood-thirsty animals were trained for so barbarous a purpose as the destruction of the human race; yet it has been maintained, that they were purposely confined, and sparingly supplied with blood and other animal food; and that, to accustom them to this inhuman practice, the figure of a negro, stuffed with entrails, blood, and other materials of a similar kind, was hung up in their kennel, and, while their usual subsistence was withdrawn, the effigy was gradually lowered down till it came within the reach of these voracious animals, who speedily tore it asunder and devoured its contents. It was in this manner they were trained to act against the negroes, whom it was intended they should hunt and tear to pieces like any other animal of the chace; and such was the ungovernable ferocity of these dogs, that, whenever they broke loose, they indiscriminately attacked men and children and devoured them.

The *Spanish Pointer*, although originally of foreign extract, may now be considered as naturalized in Britain, where the breed has long been preserved perfectly pure. He is a smooth robust dog, with a strong thick muzzle. His nature is such that he seldom requires any instruction, whereas much time and pains are requisite in training the English pointer. Dogs of the setting kind are in general of a mixed breed between this species and the English pointer, and are used for all kinds of game, whether for the gun or net.

The *English Setter* is entirely of a different figure, and of a more delicate shape, with long silky hair, and is extremely active, sagacious, and persevering, and always approaches the game with a low, cowering, and cautious step. Caius mentions three varieties of this dog, the spaniel, the setter, and water-spaniel, which last, being entirely covered with long curled hair, is the *grand harbet* of Buffon. These dogs have long been in high repute upon the continent of Europe. Intimately allied to the last of these is the springing spaniel, or cocker, used by sportsmen solely for the purpose of raising the game. Of this kind is King Charles's dog, distinguished by its curled hair, web feet, and long ears. It obtained its name from being generally the attendant of that monarch. Another variety of this kind is the Pyrame dog, distinguished by a reddish spot above each eye, with legs of the same colour, the body being generally black. Allied also to this species, is the shock dog, extremely small, and almost entirely hid in the vast quantity of its own hair. Also the lion dog, so named from its figure, and the long shaggy hair which covers all the fore part of its body. The dog called the comforter, a little elegant, noisy, and snappish animal, used chiefly as an attendant upon the ladies, is likewise of this species.

Newfoundland Dog.—This animal is of great size, measuring six feet two inches from the tip of the nose to the extremity of the tail, and proportionable in its strength and thickness. Being web-footed, he is a dexterous swimmer, dives with great facility, and when any thing falls to the bottom of the water, of a moderate weight, he brings it up with the greatest ease. By his superior strength and docility, he is of great use to the inhabitants of these northern regions in dragging wood from the interior to the sea shore, so that one of them can easily draw one hundred weight on a sledge for several miles, and, when loaded, they go and return of their own accord; and so great is the sagacity of these dogs, that they have been known to rescue children, and even men, from a watery grave.

The *Rough Water-dog*, used chiefly in duck-hunting and the destruction of aquatic birds, swims with great facility, and is much valued on board of ship for his usefulness in recovering any thing that may have fallen over-board, as he carries and takes up birds that are shot when they drop into the sea. There is also another fine variety of this kind, the large water-spaniel with crisped hair, long ears, and a mild and sagacious aspect. Similar to this in shape, temper, and habits, is the small water spaniel. The capacity of these dogs for imitation is truly wonderful. They are very dexterous in discovering any thing that their master may have lost, and, as they fetch and carry, they frequently recover their master's property. Though chiefly used for finding water-fowl that may have been shot or disabled, yet the promptitude with which they obey the signals and orders of their master, and the tricks they are often taught to perform, shew that they are possessed of the most surprising sagacity.

The *Turnspit* has a long body and short legs, bent outwards, with a curled tail, and is often peculiar from the colour of its eyes, the iris of the one being white, while the other is black; and although formerly used chiefly for turning the spit, it is not deficient in spirit, vigilance, or courage.

The *Pug-Dog*, though formerly a favourite in England, is now very rare, and appears to be but a smaller breed of the bull dog.

The varieties of dogs are very numerous, and the mixture of the different breeds is so great as to preclude the possibility of describing all the other individual races; nor is it possible to ascertain the principal stock from which they spring. The *Systema Naturæ* enumerates thirty-four, besides a Peruvian dog, and two varieties of the turnspit. Sixteen kinds of English dogs have been characterised both by Caius and Daubenton, the latter of whom likewise enumerates five additional breeds, proceeding from the intermixture of the former races, with five more, the compounds of the mongrels themselves. From these proceed an endless variety of mongrels, dancers, missets, lap-dogs, waps, poodles, and other compounds, all of which, however mixed and compounded, constitute but one general race, as is obvious from the numberless varieties which are produced.

The sagacity of all the different races of dogs is truly wonderful, and of all the animal tribe the dog is the most useful attendant upon man. When his master is blind, he safely conducts him from door to door, and from one city to another. In the morning he leads him abroad, and in the evening guides him home, and is equally serviceable, and attached to him, whether in a state of wealth or of poverty. From his nature he is also capable of great docility. Whilst repulsive to strangers, and especially to persons of a suspicious appearance, he can intuitively distinguish those who are friends to his master's family, receives them with kindness, is the faithful guardian of his property, and ready upon all occasions to defend his person. He can be taught to seek and discover what his master has lost, to pursue the thief and recover the property that is stolen, and to carry from one place to another what his master desires him. It is stated by Faber, that one of the family of Medici had a dog which attended him constantly at table, carried him his plates, and even his wine, in a glass upon a salver, which he held in his teeth, and that he held the stirrups for his master as he mounted his horse. Plutarch mentions a dog which, in the presence of the Emperor Vespasian, feigned the drinking of poison, and the violent tremor that followed in consequence of it, stretching out his limbs as if dead, till at length, by the orders of his master, he languishingly opened his eyes, lifted his head, and recovered. In the memoirs of the French academy, it is stated that M. Leibnitz himself saw one of these animals which could pronounce about thirty German words, although it seems more than probable that these could not be very accurately articulated. It must be owned, that, great as the authority may be, this is truly surprising; but whatever degree of imagination there may have been in this belief, yet a circumstance of this kind ought not to be considered more incredible perhaps than the chattering of the parrot or the raven.

The dog is subject to numerous diseases, more especially when young. Besides the distemper which often proves fatal before he arrives at full growth, he is subject to the most dreadful of all maladies, the hydrophobia, or furious madness. This dreadful disease commences with loss of appetite, dullness, and the appearance of great anxiety, and the total change of his usual habits. In this state he elevates his head, continues to howl, and is extremely exasperated by any person with whom he is familiar holding out a stick to him. He at length manifests the strongest symptoms of impatience, runs furiously from his master's house; never stops his pursuit; bites at every animal that comes in his way, and having run till exhausted with fatigue, he sometimes returns. This disease he seldom survives beyond the fourth or fifth day, and although during the continuance of it, he is considered to feel in general the dread of water, yet some of the species in this state of madness will lap it although they cannot swallow it.

Linnæus enumerates various characteristics peculiar to this race. Like most carnivorous animals, the dog is capable of existing a great length of time on very little sustenance. He is fond of tainted flesh, capable of breaking down the hardest bones with his teeth, and digests them without difficulty; but nothing, it is said, can induce him to eat dogs' flesh, how much soever it may be disguised. For a vomit he eats grass. He runs obliquely, carries his tail inclining to the left; runs at a stone when thrown at him; howls at certain musical notes; frequently goes round the place where he intends to lie down; caresses his master; barks at a stranger. When on a journey with his master he runs before him, and, on coming where the road divides, looks back or stops to observe which way he inclines to go. He will assist any one, it is said, against a wild beast, and will not bite any one that lies down. When guilty of a theft, he carries his tail between his legs, with his ears inclining backwards, and slinks off; is restless at the approach of bad weather; often barks in his sleep, and has a tremor on his limbs when he is supposed to dream.

The female goes with young 63 days, and brings forth in general from four to ten at a time, but in some instances a greater number, and there has been one instance well attested of a greyhound having no less than seventeen; moreover, Gesner mentions that Albertus saw a female that had 19 at a birth. The mother, however, is unequal to the task of rearing so great a number, and it is therefore the business of the owner to select the best.

In making a selection of the best dogs from a numerous litter, some are of opinion that the one which sees last is the most valuable. Others, again, remove the whole at a small distance from the kennel, and choose that which the mother takes up first, and according to the order in which she carries them back; but in respect to the choice of greyhounds, those that weigh the least when sucking are esteemed the swiftest, and those of the greatest weight are supposed the strongest. The reasons which determine such a selection, however, seem to be rather imaginary than real. Aristotle remarks, that the first is commonly a male, and always has a strong resemblance to the father, and that in a numerous litter it is next to a miracle if they be either all males or all females, which he considers an argument illustrative of the design of Providence for preserving the species.

In ancient times, dogs were frequently offered in sacrifice to idol deities. Pliny states that the Carians considered whelps of great avail in pacifying their resentment. The Greeks and Romans, as Plutarch informs us, sacrificed these animals at their Lycæan and Lupercal feasts, observed in honour of Pan, who defended their flocks from the wolf. Dogs were likewise held sacred in the temple of Æsculapius, because he was nourished by their milk; and even Jupiter was called a dog-leader, because he taught the Arcadians to hunt away troublesome beasts from their flocks by the help of dogs. On account of their astonishing sagacity and usefulness, the ancients frequently honoured dogs with solemn funerals in their hallowed cemeteries; and Alexander even built a city to perpetuate the memory of one of these favourite animals. Varinus mentions the fable of Orion, who was an excellent hunter, and who on this account was deified and placed among the stars, and that the star *canis* was stationed beside him as his hunting dog. It appears that the ancients frequently offered dogs in sacrifice to this constellation, and the poet Ovid alludes to this practice in these verses:—

"Pro cane sidereo, canis hic imponitur aræ;
Et quare fiat nil nisi nomen habet."

In the symbolic characters used by the ancient Egyptians, the dog is frequently represented with a king's robe, to signify a magistrate; and in their hieroglyphics, dogs signified the two hemispheres which watch over our heads, as the hawk signified the sun, and the ibis the moon.

The ancients seem to have been foolishly impressed with the belief that the different kinds of dogs were bred from tigers, apes, panthers, leopards, and lions. The celebrated Hircanian dogs, probably owing to their natural fierceness, are represented as descended of the tiger; the Arcadian, on account of their boldness, from the lion, and those of France from the wolf; and to this Virgil no doubt alludes in mentioning the dog Lycisca:

——"referensque lupum torvo ore Lycisca."

In rude ages, these animals were frequently made use of to assist and defend their masters even in the field of battle; and the Cimbrian and Hircanian dogs were considered on this account to be extremely valuable. The remarkable instinct of this animal is truly wonderful, and the instances of their sagacity are so numerous that it would be endless to recount them.

There is a beautiful fable, narrated by Xenophon, of the sheep and the dog, with the account of which we shall conclude the history of this valuable animal.

The Complaint of the Sheep to the Shepherd concerning his Dogs.

"We marvel at thee," said the sheep, "that, seeing we yield thee milk, lambs, and cheese, whereupon thou feedest, nevertheless, thou givest unto us nothing but that which groweth out of the earth, which we gather by our own industry; and whereas the dog doth none of all these, him thou feedest with thine own hand, and bread from thine own trencher. The dog, hearing this complaint of the sheep, replied, that his reward at the shepherd's hand was just, and no more than he deserved; for, said he, I look unto you, and watch you from the ravening wolf and pilfering thief; so that, if once I forsake you, then it will not be safe for you to walk in your pastures, for peril of death: whereunto the sheep yielded, and did not reply to the reasonable answer of so unreasonable a beast."

This fable was intended to illustrate the foolish murmuring of some inconsiderate persons against the principal ministers of state, that are liberally rewarded by the prince's own hands for their watchful custody of the commonwealth.

Those readers who may be desirous of a more particular account of the nature and habits of this useful animal, may consult Pliny's *Natural History*, book 8.; Strabo, book 4.; Buffon, *Histoire Naturelle*, tom 5. and 14; F. Cuvier, *Sur le Chien de la Nouvelle Hollande*, ap. *Ann. du Museum d'Hist. Nat. Memoires de l'Acad. Royale*; Phillip's *Voyage to New South Wales*, p. 274; Crantz's *History of Greenland*; Strutt's *Sports and Pastimes*; Daniel's *Rural Sports*, and the *Sportman's Cabinet*.

Spec. 2. *Lupus.* Wolf.—*Char.* Body of a light grey colour, and yellowish, but varying in shade in different countries; tail inclined inwards, and hanging down.

This animal bears a striking resemblance to the dog, though more fierce in appearance, broader in the face, and larger in the whole form; and the two species have been known to propagate, the time of gestation being in both nearly the same. It enjoys a wonderful sense of smell, and its hearing and sight are remarkably acute. When impelled by hunger, the wolf is

"Cruel as death, and hungry as the grave,
Burning for blood."

It is chiefly from necessity, however, that this animal exerts his strength and fury; and he is capable of existing for days without food, allaying the keen sensation of abstinence by swallowing earth or mud. So keen is the wolf in pursuit of blood and carrion, that it has been known to watch the motions of armies, with the view of devouring the slain. Herds of this species sometimes unite in dreadful works of devastation, when man himself often becomes their victim, and every domestic animal, the horse excepted, falls a ready prey. Having a preferable relish for human blood, it will attack the shepherd rather than his flock. The wolf has, from time immemorial, been justly viewed with detestation; and to extirpate him from the face of the earth, no attempts have been left untried. A certain number of wolves' tongues procured the remission of crimes in England in the time of King Edgar; likewise a tribute of 300 wolves' heads was accepted in Wales, instead of the gold and silver tax; and for their extinction, several centuries afterwards, individuals enjoyed lands and other advantageous rewards. After England was cleared of these animals, Ireland appears to have been harrassed with them, and in 1710 was granted, at Cork, the last presentment for destroying wolves. These animals have been greatly reduced in number in North America. In the polar regions they subsist by preying on seals and other animals.

The wolf, when fatigued or fully satisfied with food, commonly indulges in sleep. From three to nine young ones are produced by the female at a litter, and are nursed by her with the greatest care. It is remarkable that the wolf is capable of being tamed, and taught various amusing tricks and gesticulations. In barbarous countries, and before the introduction of dogs, it was employed in the hunting of wild animals. Count de Buffon observes respecting the wolf: "There is nothing worth belonging to this animal but his skin, which is manufactured into coarse but warm and durable furs. His flesh is nauseous to every other animal, and the wolf alone willingly eats of the wolf."

Spec. 3. *Hyæna.* Hyæna.—*Char.* Body light brown striped with black; mane upright; ears naked; tail straight, and feet four-toed; hair coarse and long.

This wild and solitary species is most common in Asiatic Turkey, Syria, and Barbary. It is about the size of a wolf, which animal it resembles a good deal in its habits, and has peculiarly strong limbs and a large black snout. In pursuit of its prey it carries its head in the manner of a stag. The hyæna has remarkably good eyes and a very stiff neck, and is extremely swift when put to his full speed. Savage and gloomy in his aspect, he exhibits all the indications of a cruel malignant disposition; and such is his strength and spirit, that he will even attack the ounce, and dare the panther and the lion. He makes a hideous cry, which begins commonly with a low moaning tone, resembling that of the human voice. His residence is in subterraneous dens or caverns, where he conceals himself through the day, always roaming abroad under night in search of prey; and, when impelled by necessity, he not unfrequently has recourse to the church-yard and devours the bodies of the dead. These animals have been observed to assemble in considerable numbers and watch the movements of an army, in the prospect of glutting themselves with the carcasses of the slain. They likewise frequently commit depredations among domestic animals, being in their excursions intimidated neither by fire-arms nor the sight of man. Though this savage animal be naturally very untractable, some instances of taming him have nevertheless occurred. According to Mr Bruce, these animals are exceedingly numerous and troublesome in Abyssinia, and are of a much more ferocious character than those of Barbary. The wild dog of the Cape is mentioned by Burchall as an undescribed and ferocious species of the Hyæna.

Spec. 4. *Aureus.* Jackal.—*Char.* Head of a fox red colour, mixed with greyish hairs; upper lip white on each side of the nose, throat also white; neck and back greyish-yellow, and belly reddish-yellow; whiskers black; tail straight and bushy; four middle front teeth truncated; two exterior larger above, in the lower jaw rounded; canine upper teeth larger than the under; grinders on each side six.

The jackal is about thirty inches long, without the tail, which of itself measures eleven inches; and it is very common in Asia and some parts of Africa. The appellation of *lion's provider* has been given to this species, on account of the vociferous clamour they make in the forests, which by the lion and other animals is taken as a signal for the chace. The lion and other wild animals follow the sound of their howlings in the chase, till they hunt down their prey, when they come up and feast on the spoil,—and hence the term the lion's provider.

The voracity of the jackal is extreme. These animals go in herds, and in the night-time prey on the antelope race, or, approaching villages, devour lambs, poultry, &c. and ransack church-yards, consuming the putrid bodies of the dead. When animal prey is not to be had, they eat roots, fruits, and even the leather of old boots and shoes. The sight of travellers does not seem to appal them, as they stand to view them deliberately. The female produces annually from five to eight at a time, and goes with young about thirty days. The jackal, when young, is readily tamed, and assumes most of the qualities of the dog, to which it evinces attachment. Indeed this animal seems more allied to the dog species than the fox and wolf are; and Galdenstaed and Pennant have gone so far as to represent it as the legitimate origin of the canine race.

Spec. 5. *Vulpes.* Fox.—*Char.* Head broad, with a sharp snout; ears sharp and erect; eyes in an oblique position; body covered with hair; tail straight, bushy, and pointed.

This well known animal varies in size and colour according to climate, and is common in the northern and temperate parts of the globe. The fox is more remarkable for cunning than for courage, and is peculiar for a very fœtid smell. Its bark is loud and continued, and its dwelling is usually in woods, brakes, or coppices, and not far from some village or farm-yard. This animal rarely becomes perfectly domesticated, and is by no means of a kindly or liberal disposition. In the pursuit of his prey he is extremely cautious, and what he cannot immediately make use of he carefully conceals. He commits serious depredations in farm-yards, and also among vines, being very partial to grapes; but, when hungry, he eats roots, insects, carrion, or shell-fish. When he engages in robbing a bee-hive, he rids himself of his numerous opponents by rolling his body on the ground, and, having destroyed all the bees, he feasts himself deliciously with the honey. It is said that the fox is not changeable in respect of his abode, the same individual having been several times surprised in the same hole; but he retires to a more secure retreat when he begins to dread danger. All the proceedings of the fox are strikingly marked with foresight and prudence, as this animal is ever taking advantage of experience from his strong faculty of recollection. He wisely eludes every lure, and even smells the iron of the trap. His presence is sometimes announced by crows, magpies, and other birds, who, when they perceive him, continue to utter a clamorous outcry in detestation of their common enemy. He is fond of basking in the sun, but commonly sleeps during most of the day, in a round position, like the dog. From three to six young ones are annually produced by the female at a birth, and she is sagaciously careful of her offspring, which are at first blind, and continue growing for a year and a-half. The soft and warm fur of this animal's skin is used for lining clothes or making muffs; fox skins consequently form an important article of commerce. Many of them are imported from Newfoundland, Hudson's bay, and other quarters; and so plentifully are they obtained in the mountainous parts of Switzerland, that two or three thousand skins will be at times possessed by a Lausanne furrier. The flesh of the fox has a nauseous flavour, but is used for food in some parts of Europe, and likewise at Hudson's bay. For a farther account of the fox, see SPORTS and PASTIMES.

Spec. 6. *Lagopus.* Arctic Fox.—*Char.* Hair of an ash colour, but white and woolly in winter; nose sharp; ears short; tail bushy.

This species is not so large as the common fox, but equally cunning, and is chiefly found in those countries bordering on the Northern ocean. They inhabit the clefts of the rocks in Greenland and Spitzbergen; but in other regions, where the ground is not too much hardened with frost, they form for themselves a subterraneous retreat, the bottom of which is laid with moss. The arctic fox is well adapted for swimming, and thus pursuing its prey from one island to another. Water-fowl and their eggs, as well as hares and other small quadrupeds, are its principal subsistence, and sometimes berries and shell-fish supply the place of better food. Its main object of prey, in Lapland and the north of Asia, is the lemming or Lapland marmot. The female produces nine cubs at a time, and proves a faithful nurse and guardian of her offspring. In taking the arctic fox, pit-falls, springs, or traps baited with a piece of capelin fish, are employed. The skin is an article of traffic, and the flesh of the animal is sometimes used for food by the Greenlanders.

Zerda. Fennec.—*Char*. Eyes large and bright; ears extremely large, with a very small orifice, and edged with a margin of white hair; legs formed like those of the dog; tail long, and tipt with black.

This animal is of a yellowish-white colour, and measures about ten inches in length. The Moors call it zerda; but Mr Bruce, who particularly describes it, says that its proper name is fennec. It is a native of the deserts of Zaara in Africa; feeds on locusts and other insects; has a bark like a dog, but rather more shrill; and is exceedingly vigilant and swift. Mr Bruce confutes the notion entertained by Jews and Arabians, that the fennec is the coney of Scripture.

Genus 2. *Felis*.

Char. Muzzle short; head rounded; four grinders in each jaw on each side; fore feet five-toed and hind ones four-toed; claws retractile; tongue prickly.

The animals of this genus are found in both continents, varying in colour and size, but similar in form and disposition. They are solitary and ravenous, and refuse all vegetable food unless when pressed with hunger. Instead of uniting for mutual safety, they are rather opposed to each other. In the pursuit of their prey they are swift and ferocious. The females have four teats on the breast and four on the belly.

Spec. 1. *Leo*. Lion.—*Char*. Body pale tawny; ears plain; tail long.

This magnanimous animal, when of the largest size, is about eight feet in length, independent of the tail, which is nearly four feet long. His noble gait and courageous aspect, together with the motion of his tail and the rearing of his large flowing mane, impress the beholder with a sense of awe. The structure of his body strongly bespeaks the superiority he is destined to maintain over many of the other inhabitants of the forest; and he is not more remarkable for the dimensions of his frame than for his strength and activity. The head of the lion is large, the eye balls fiery, eye-brows ample, and ears rounded; the mane is yellowish-brown, and on each side of his neck and head is almost two feet in length. He makes his residence in the thickest parts of the forest, and ranges for his prey towards night. From the circumstance of his directing his mouth to the ground when he utters his terrific roar, the other quadrupeds cannot well ascertain the particular direction whence it comes, and are consequently apt to be overtaken in the dark. It is only in cases of hunger or provocation that the lion's ferocity is aroused, and he never wantonly attacks any animal. When enraged, however, he determinately withstands every opponent; and such is his energy of body, that a sweep of his tail will knock a man to the earth, and a stroke of his paw will break the neck of a horse. Such is this animal's native ardour of disposition, that he is not by any means to be intimidated, and if compelled to retreat he will do so fighting, and with his front opposed to his adversaries. It is remarkable, that so long as he remains ignorant of the superiority of man, his familiarity with conquest renders him both haughty and invincible; but when he is led to understand human power, his fortitude so completely fails him that he has been known to fly even from women and children. In proportion, indeed, as this animal comes nearer the haunts of men, his natural courage is observed to decrease, insomuch that even the human voice will alarm him.

The lion inhabits the interior of Africa, and the warm parts of Asia; but it is principally in the African deserts that he reigns sovereign master of the forest. This species is now comparatively rare in Turkey, Persia, and the Indies; and, according to Dr Shaw, the province of Lybia cannot now produce as many lions as the ancient Romans used to import from that country in a single year for their exhibitions.

In the taking of his prey, the lion generally has recourse to stratagem, waiting patiently the approach of some animal until within 15 or 20 feet of him, when he makes a sudden dart, which, if unsuccessful, he does not repeat, but rather waits another opportunity. Having caught his victim, he often accompanies the mortal wound with a dreadful roar. As bones are readily broken by means of his strong teeth, he swallows pieces of them with the flesh; and, having fully allayed the calls of appetite, by eating, as is supposed, a sufficiency for two or three days' subsistence, he quietly retires to his den.

When in a peaceable mood, the mane and tail of the lion appear at rest; and on such occasion, travellers may pass unmolested by him at no great distance. Indeed instances are not wanting of his generosity in sparing the lives of animals in his power; and, in regard of the human species in particular, it is observable that he does not uniformly take advantage of every one within his reach. Sparrman makes mention of a man having been left in life after being thrown down and wounded by a lion. But, notwithstanding the general attributions to this animal of magnanimity and gratitude, he is, by Mr Barrow, supposed to be not without indolence and meanness in the natural state. It must be admitted, that while some of this species are found remarkably placid and docile in the possession of their keeper, others, bred perhaps under the same circumstances, are rather furious in their disposition. In confinement, the lion has commonly an allowance daily of about four pounds of raw flesh and a quart of water. The species have been known to breed in the Tower of London, in the royal menagerie at Paris, and in other parts of Europe.

The lioness is distinguished by the want of a mane, and she is weaker and about a fourth less in size than the lion. She is generally supposed to go five months with young; but it has lately been observed that she goes only three months and a-half. Three or four young ones are produced by her at a time, and to these she is so very warmly attached that, in the pursuit of prey for their support, her fury is unrestrained. The young ones are mild and playful, are nursed twelve months by the dam, and attain maturity in about five years. The period of existence natural to the lion appears to be much longer than Buffon supposes, namely, twenty-two years; for the lion Pompey, which died in 1760 in the Tower of London, had been kept there upwards of seventy years, and another one from the river Gambia died at the age of sixty-three in the same place. For the sake of his skin and flesh, the lion is commonly hunted by means of dogs about the Cape of Good Hope. The negroes use the flesh for food, and preserve the grease for medicinal purposes; and the skin, which was once adopted as a robe of honour, is now employed as a covering for a bed.

Spec. 2. *Tigris.* Tiger.—*Char.* Body of a tawny or orange-yellow colour, and marked with long dark streaks; tail elongated.

This beautiful, but terrific animal, is about nine feet in length without the tail, which of itself measures four or five. The name tiger, importing an *arrow* in the Armenian language, has been injudiciously applied by some to the panther, leopard, jaguar, ounce, and other animals of the feline tribe; but the genuine species, found chiefly in Asia, India, and the Indian islands, is called, by way of pre-eminence, the royal tiger. The tiger is proverbial for his furious disposition; and so enormous is his strength, that he will, with comparative ease, bear away the body of a buffalo. So ferocious is this animal that he will even seize upon and tear the person that feeds him. A dreadful accident of this kind happened lately to one of the keepers of some wild beasts, belonging to Mr Ballard's collection at Woolwich. One of the keepers was cleansing the den of a tiger, just previous to the feeding-time, when it is the custom to move one of the bars of the cage. This was the case, and the unfortunate lad was in the act of stooping to take up a pail of water standing close to the cage, when the tiger, impatient for his provender, darted one of his paws through the enlarged space, and seizing him by the head, laid the skull entirely bare. The screams of his victim, still held within the dreadful grasp, brought two other keepers to his assistance, who succeeded in liberating him, but not until he was covered with lacerations, and torn in every direction in the struggle to escape, and completely washed in gore. The sufferer was conveyed to town, to Guy's hospital, where the scalp was restored to its place and sewed up, and his other wounds dressed.

But although the tiger be thus naturally fierce and dangerous, yet, if caught when young, he is capable of being in some degree domesticated. His roar, which is altogether dreadful, is at first solemnly slow, and gradually increases till it ends in a terrible cry. In taking his prey he darts instantaneously upon it from his concealment with a tremendous yell, and if his aim be unsuccessful he does not repeat the attack. Being particularly fond of man as his prey, the most fearful ravages have been frequently committed by him; and thus an almost incredible number of lives is annually lost in Sumatra, where the absurd doctrine of transmigration renders the people in a great measure passive to his horrid cruelty. Animals capable of defending themselves are not attacked by him in an open manner; but he is notwithstanding fearless of every power, contending to the last even with the lion himself. The tiger usually lurks in thickets, whence he rushes with devastating fury upon the hapless objects of his desire, and with a horrid thirst he quaffs the blood of his victim. Fire and noise have sometimes been found effectual in scaring him; therefore travellers go for mutual safety in great companies, carrying lanterns before them in China and Tartary; and the shrill sound of French horns proves a safeguard in travelling through Java.

The tigress brings forth four or five at a time, and is generally supposed to go three or four months with young. In the defence of her offspring she is savage in the extreme, and her fury when robbed of her young is inexpressible. The flesh of the tiger is eaten in some countries, and particular parts of the body have medical virtues ascribed to them by the physicians of India. In all eastern countries the skins of these animals are much esteemed, and the seats of justice in China are commonly covered with them.

Spec. 3. *Pardus.* Panther.—*Char.* Body yellow, and having the upper parts marked with circular spots, and the lower with stripes; tail elongated.

Spec. 4. *Leopardus.* Leopard.—*Char.* Body yellow, with black spots almost contiguous.

The panther and leopard very much resemble each other, and the habits of both are pretty similar to those of the tiger. Indeed the two species have been often confounded; but the leopard is neither so large and fierce, nor so dark in colour, as the panther, who is sometimes distinguished by his having a central spot in each circle peculiar to himself. Both species inhabit Africa.

Spec. 5. *Uncia.* Ounce.—*Char.* Body whitish, and marked irregularly with black spots; tail long.

Spec. 6. *Jubata* Guépard or Hunting Leopard.—*Char.* Neck slightly maned; colour pale fulvous, with black round spots; tail not long.

Spec. 7. *Puma.* Puma.—*Char.* Body of a reddish-brown colour, but rather white below; tail lengthened.

Spec. 8. *Capensis.* Cape Cat.—*Char.* Body fulvous, and striped with black above, and on the other parts marked with rounded and lunated black spots; ears with a lunated white bar; tail long, and circled with black.

Spec. 9. *Catus.* Common Cat.—*Char.* Tail barred with dusky rings; body yellowish-grey, with longitudinal bands on the back, and spiral ones on the sides.

This familiar animal is prevalent throughout Europe and Asia. In the natural state it is very large and strong, of a light yellow colour, intermixed with grey, and has a dusky list along the back. It is well denominated the British tiger, being remarkably furious and obstinate in its own defence. In woody and hilly districts, it preys on birds, moles, hares, and even young poultry, and tender lambs and kids. The wild race of cats is now happily extirpated from the southern parts of Britain, having been at one period an object of the chace; but they are still numerous in some of the mountainous parts of Scotland and Ireland. They breed in the crevices of almost inaccessible rocks, and are often shot or taken with traps. It appears to be generally admitted, that the wild and the domesticated cat are of the same species, though it is uncertain whether the varieties of the latter have sprung from the former. As an instance of the great size sometimes attained by the cat, one is mentioned by Bewick which was five feet long from nose to tail.

There are many varieties of the domestic cat, and some of them very distinctly characterised; but the most remarkable are the Persian and the Angora. The former is of a fine grey colour, remarkably glossy, and having its tail long, and covered with flowing hair; and the latter has long silvery hair, chiefly on the neck, but is sometimes found of a dun colour, blended with yellow. That beautiful variety call the *tortoise-shell cat* is common in Egypt, and supposed to belong originally to that country. The species found in China is glossy, and variegated with yellow and black, and has pendulous ears.

The cat has long been held in esteem by the Egyptians, and appears by no means so void of grateful sensations as Buffon has stated. Indeed, the character of this useful species has been much misrepresented, as instances are by no means wanting of its docile and generous disposition. It seems by nature destined for domestication. The period of its existence extends to ten or twelve years, and for tenacity of life it is proverbial. Its usual prey is rats, mice, and birds; but the notion that it also preys on fish seems opposed to its regard for dry feet. The hair of the cat is electric, and its eyes appear very bright in the dark. When pleased, the cat is observed to pur, and to spread out and alternately retract its claws, and also to raise and put down its fore-legs; but, when provoked, the tail becomes agitated, and the creature spits, hisses, and strikes with its feet. The cat sleeps very soundly, particularly in winter, and prior to a storm of snow. The practice of licking its fur and cleansing its face, which it uniformly observes after meals, has been thought allusive of a fall of snow or rain. The whiskers of the cat are supposed to be analagous to the antennæ of some insects. Owing to the form of its teeth, it picks its food in small morsels.

The female produces from three to six at a litter, and that two or three times in the year. Like the sow and the rabbit, she has been, unaccountably, known to devour her kittens as soon as they came into existence; but in the nursing of her young she is admirably assiduous, and in cases of danger carefully removes them, one by one, to a safe retreat. It is remarkable that, besides her own offspring, she has sometimes nursed the young of leverets, squirrels, dogs, and even rats. In northern countries, especially Russia, the skins of cats constitute an important branch of trade.

Spec. 10. *Lynx.* Common Lynx.—*Char.* Body rufous grey, delicately spotted, and whitish below; tail at the tip black; point of the ears tipped with pencils of long black hair.

The length of this animal, from head to tail, is generally four feet. It has a singularly piercing eye, has strong limbs, and its body is covered with long soft hair. The lynx is a native of Europe and the northern parts of Asia and America. He makes an easy prey of ermines, weasels, squirrels, and some other animals, on which he usually darts suddenly from the branches of the loftiest trees, and, seizing his victim by the throat, gluts himself with blood. The lynx even preys on his own species when pressed for food. The dog is scarcely a match for this animal, who defends himself obstinately with his claws. He howls like the wolf, and is of a fierce disposition, and difficult to be tamed. The female is less spotted than the male, and she produces three or four young ones at a time. The fur of the lynx, being warm and soft, is a valuable object of commerce.

Genus 3. *Viverra.* Weasel.

Char.—Tongue, in some of the species, smooth, and in others with prickles reversed; sharp cutting teeth six, canine long.

In this genus Mr Pennant includes the mustela; but Dr Shaw describes the otters apart from the viverra tribe. The weasel species are of a lengthened form, with sharp visage, short feet, and long tail; and many of them are peculiar for an intolerable odour, which in a great measure preserves them from their adversaries. Besides birds and rabbits, they feed on vermin of all kinds, and are even beneficial for the destruction of rats and mice. Weasel skins constitute an article of trade. The number of species is about twenty-three.

Spec. 1. *Vulgaris.* Common Weasel.—*Char.* Ears small and rounded; eyes black; whiskers; tail about two inches and a half in length; body light brown, with the belly white.

This species measures, from nose to tail, about seven inches and a half, and abounds chiefly in the temperate regions of Europe, Asia, and America. They are active and cunning little animals, frequent visitants in granaries and barns, and very destructive to birds, poultry, and rabbits. Being capable of ascending trees and walls with facility, they are extremely intrusive, and very successful in the pursuit of prey. The day is generally passed by the weasel species in sleep, and they commonly venture from their retreat towards evening on predatory excursions. These animals are chiefly fond of mice, fish, eggs, and fungi, and prefer flesh in the putrid state. They drink frequently, have a very fetid smell, and are, in their habits, unclean. The female produces, in spring, four or five at a litter. In northern regions, the furs of the weasel constitute an article of commerce to China.

Both this species and the ermine were at first pronounced untameable by Buffon, but he afterwards retracted this erroneous opinion. The weasel, however, is capable of being domesticated only when young, and that by means of great care and attention.

Spec. 2. *Furo.* Ferret.—*Char.* Ears round; eyes red and fiery; nose very sharp; colour generally yellow.

This active little animal has been supposed of the same species with the pole-cat, which it strikingly resembles. Its length is generally about twelve or fourteen inches, independent of the tail, which is five inches long. The ferret is only domesticated in temperate countries. It is very irracible, bites severely, and, when provoked, emits an intolerable odour. When tamed, it is retained for hunting rabbits, and is always muzzled, that it may drive them out of their holes into the nets without killing them. In the domestic state its common food is bread and milk, though it prefers the blood of inferior animals. The enmity this creature bears to the rabbit is remarkably instinctive, and no rat is permitted to exist within its reach. As the ferret is incapable of enduring cold, it is necessarily kept warm in a box, or some similar substance, among wool, to defend it from the rigour of the climate. The female breeds twice in the year, and has six or nine at a time. The ferret is supposed to be a native of Africa, and was early introduced into Spain, from which it has emigrated into the more northern countries of Europe.

Spec. 3. *Erminea.* Stoat or Ermine.—*Char.* Tail at the extremity black.

In its conformation the ermine very much resembles the weasel, and is remarkable for its fine soft fur, which constitutes its most valuable quality. In the northern regions, this animal uniformly changes colour, being white in winter, but in summer light brown. It is called *ermine* when its body is completely white, and *stoat* when it is tinged with red. This animal is a native of Europe and the colder regions both of Asia and America; is chiefly found in meadows, woods, and hedges, and in the vicinity of brooks, and preys on squirrels and mice. Its length is about ten inches, exclusive of the tail, which measures fully five inches; and it is usually caught in traps or killed with blunted arrows for the sake of the skin, which is employed as an ornamental part of dress. The fur of the ermine is in its greatest perfection in winter when it is white, being soft as the finest silk, and very thick, whereas in summer it is coarse, thin, and dusky brown. The furs from Siberia and Norway are the most valuable.

Spec. 3. *Ichneumon.* Ichneumon.—*Char.* Great toes remote; tail thick at the base, tapering, and tufted at the extremity; eyes small and red; hair coarse; ears rounded and naked.

In form and shape, this animal is not a little similar to the pole-cat, and its fur is speckled with an intermixture of grey, brown, white, and fawn colour. It abounds in Egypt, where it is extremely useful in destroying rats, mice, serpents, and noxious insects of every kind, and the eggs of crocodiles, which it frequently digs out of the sand. Although a small animal, it is very fierce, and fears neither the vengeance of the dog, the claws of the vulture, nor the sting of the serpent. The ichneumon is said to be a dexterous swimmer; its cry, when provoked, is soft and murmuring, and it emits a fetid odour. When asleep it is rolled up like a ball, and is not easily awaked. In pursuit of its prey it often feigns being dead, and is thus enabled more dexterously to seize upon it. Its motions being very quick, it is even more serviceable than the cat in destroying vermin. On account of their great utility this species of animals was highly valued in ancient Egypt, where they were domesticated; but the northern climates of Europe are too cold for their delicate constitution. They abound in all the southern parts of Asia, and also in Africa, especially about the Cape.

Spec. 4. *Civetta.* Civet, or Civet Cat.—*Char.* Body of a yellowish-grey colour, and longitudinally marked with blackish spots; ears short, and rounded; eyes sky-blue, and very bright; hair along the back coarse, erect, and forming a kind of mane; teeth sharp and strong.

From nose to tail the civet measures fully two feet, and the tail itself is nearly fourteen inches. This species is found in different parts of Africa and India; but, though abundant in warm regions, ceases to be prolific when removed to cold climates. They are naturally furious, have a voice somewhat similar to that of a dog when provoked, and they prey on birds and smaller animals. Being extremely voracious, they often commit serious depredations in farm-yards, by killing and devouring poultry. These animals are chiefly valued for a kind of strong perfume termed *civet*, secreted in a large glandular receptacle situated at a small distance below the tail, and thence emitted spontaneously. When kept for the production of this substance which is regularly collected and preserved for the perfumers, they are generally confined in boxes or cages of strong wood, so narrow as to prevent them from turning round to bite the person who collects or draws out the perfume with a small spatula or other instrument. The civet has the appearance of a yellow unguent, which, till mellowed by age, is extremely strong and unpleasant. This perfume has been often improperly confounded with musk.

Spec. 5. *Foina.* Martin.—*Char.* Ears rounded; eyes lively; tail bushy, and darker than the body, which is blackish, with the throat white.

This beautiful little animal inhabits Britain, and many other parts of Europe; lives chiefly in fields and woods, where it subsists on eggs, birds, and the smaller species of animals. It bears an inveterate enmity to cats, and has a musky smell, which to dogs is intolerable. Though prone to liberty, it is capable of being domesticated when young. The martin breeds in the hollow of a tree, or in the cleft of a rock; and from three to seven are produced by the female at a time. Notwithstanding its strong and disagreeable flavour, the flesh of this animal is in some countries used for food. The fur is profitably employed in the trimming of robes.

Spec. 6. *Zibellina.* Sable.—*Char.* Of a dark brown or black colour, with the throat grey; whiskers long; ears round; feet large; claws white; tail bushy; fur fine, and glossy.

The general appearance of this animal is very like that of the preceding, but the tail is considerably shorter. The colours of the sable are extremely apt to vary even in the same individual at different seasons and in different climates; but the skins procured during winter are generally of a dark hue. This species abounds chiefly in Northern Asia, and is likewise found in the northern regions of America. The fur of the sable, it is well known, is in great estimation, and consequently forms a valuable article of trade. Those which are of the darkest colour, and most glossy, are the best; and in proportion to the length, colour, and fineness, the price varies from L.1 to L.5, but sometimes a single skin has brought so great a price as L.15 Sterling.

Spec. 7. *Putorius.* Pole-cat, Fitchet, or Foumart.—*Char.* Body of a tawny black or chocolate colour, with the muzzle and ears whitish; nose sharp pointed; legs short; tail covered with long hair.

This species, somewhat larger than the common weasel, is of a long and slender form, measuring about 17 inches in length, without the tail, which of itself is six inches. The pole-cat exhibits great agility in climbing up walls, and in darting upon its prey, and is capable of insinuating itself into very small apertures as occasion requires. It is remarkably savage in its nature, and, when provoked, its smell is rank and intolerable even to a proverb; but its skin, when dressed with the hair, is used for many common purposes. In the night-time this creature goes on its predatory excursions, and proves very destructive to poultry and to every kind of game. The pole-cat is found in the temperate climates of Europe and Asiatic Russia. During summer it lives commonly in the woods, where it burrows, and makes a subterraneous retreat for itself of about two yards in length; but in winter it frequents barns, hay-lofts, and uninhabited houses. The female brings forth three or four at a birth.

Genus 6. *Lutra* (*Mustela,* Lin.) Otter.

Char.—Six cutting and two canine teeth in each jaw; head rounded; ears short; five toes joined by a membrane on each foot; whiskers long and stiff; tail of moderate length.

The chief point of difference between otters and weasels is, that the former exist mostly in the water and feed on fish. Some of the species subsist on carrion in the absence of fish. The otters are larger animals than weasels, but are unqualified for climbing and leaping, though they swim with facility. This species burrow and form retreats for their residence on the banks of rivers or lakes. They are in a degree amphibious, but are unable to live under water, for any length of time, without coming to the surface for fresh air.

Spec. 1. *Vulgaris.* Common Otter.—*Char.* Brown, but sometimes varying to silvery, with naked feet; eyes small and sparkling; ears small and erect; opening of the mouth small; legs extremely short and muscular.

The otter is generally about twenty-three inches in length from the tip of the nose to the base of the tail, and the tail itself measures thirteen inches. This species is found in Europe, the northern parts of Asia, likewise in North America, and sometimes in Britain, and is remarkable for sagacity and cleanliness. It burrows under ground, makes its residence on the banks of rivers, the entrance to which is very judiciously constructed, and inclines upwards from under the water to the surface of the ground, and in this retreat are formed different apartments, or a kind of long gallery, to all of which orifices are formed for the admittance of air. The otter, in pursuing its prey, is remarked to go against the stream, and when it procures a fish it proceeds immediately with it to the shore, where it devours it to the vent, and then sets out in pursuit of more. It is naturally fierce, but if taken young can be tamed and taught to catch fish for its keeper; and, being of an amphibious nature, it is capable of swimming faster than it can run. In winter, when the lakes and rivers are frozen, it is compelled to subsist on rats and insects, and even on sheep. When domesticated it is fed chiefly with milk and hasty-pudding. The flesh of the otter is used for food by the American Indians, and its skin is well adapted for the manufacture of gloves. At a former period, the hunting of this animal was an object of sport in England. See SPORTS and PASTIMES.

Spec. 2. *Marina.* Sea Otter.—*Char.* Body black; feet hairy; and tail short.

This species, about four feet two inches in length, including the tail, has been found to weigh upwards of seventy pounds. The body is covered with long black glossy hair, and it is quite harmless, and very affectionate to its young. It is very common in Behring's island, Kamtschatka, and the Aleutian and Fox islands; and its fur, on account of which it is hunted, is much esteemed.

Besides these, there are other varieties of the otter. The one which is a native of Poland is one-third less than the common otter, and of a tawny dusky colour, with a silvery head. The Brazilian otter, excepting the head and throat, which are of a dusky colour, is entirely black, about the size of a common dog, and weighs about forty pounds. The Cayenne otter, not more than seven inches, with a tail six, has the upper part of its body dusky, and the head and belly yellowish-grey, marked with dark spots.

Genus 7. *Ursus.* Bear.

Char.—Front teeth in both jaws six, those above being alternately hollow within; grinders on each side five or six; canine teeth conical and solitary; snout prominent; soles of the feet long; claws strong and sharp. Of the ten species described, only three are properly considered bears.

Spec. 1. *Arctos.* Common Brown Bear.—*Char.* Body dark brown; tail abrupt.

This species varies as to size and colour, and abounds in the forests of the northern parts of Europe, Asia, and America. It is carnivorous at times, but subsists mostly on vegetables. The bear is of a savage and gloomy disposition, and its retreat is generally in the most dreary and inaccessible situations. It becomes remarkably fat and inactive about the close of autumn, when it retires to its den, where it remains in a state of total inactivity, forty or fifty days, without food; and hence the vulgar error, that it subsists by licking its paws. About this period, likewise, the female finds a residence apart from the male for bringing forth her cubs, which are generally two, sometimes three, in number. These she nurses, with the most exemplary care, for four months, in all which time she submits to the greatest self-denial. The cubs are at first blind and shapeless, with pointed muzzles, and of a yellowish colour. The old bears, accompanied by their young, come abroad in the beginning of spring, and seem very meagre after their confinement. They now devour considerable quantities of fruit, which they readily obtain by their agility in climbing trees. The bear has the senses of smelling, hearing, and feeling in remarkable perfection; he is easily irritated, and has a very unpleasing growl. Notwithstanding its natural wildness, this animal, when tamed, becomes very pacific and submissive to its keeper; and, if duly tutored while young, is capable of learning a number of amusing and fantastic tricks. But in thus educating the animal, the cruelties necessarily inflicted upon it are disgraceful to humanity; and, therefore, however diverting the imitative movements of the bear may seem to the beholder, the means by which these are inculcated are highly to be deprecated.

Spec. 2. *Americanus.* American Bear.—Head long; eyes small; ears short and round; nose long and pointed; and yellowish-brown hair, smooth and glossy.

The American bears are black, and rather small, and subsist wholly on vegetables. Their skins constitute an article of traffic, and the flesh of the young ones is esteemed delicate food. Bears were known to the Greeks and Romans, and were exhibited in the spectacles of the latter. Subsequently to the extirpation of the bear from Britain, individuals of the species were occasionally imported for the purpose of baiting them; an unfeeling practice, or amusement, which seems to have been in repute in Queen Elizabeth's time.

Spec. 3. *Maritimus.* White or Polar Bear.—*Char.* Neck and head elongated; tail abrupt; body white; teeth very large; eyes and ears small; tip of the nose and claws black.

This large and terrific species, which has been known to measure more than twelve feet in length, has very long hair, and large and strong limbs, and possesses wonderful strength and ferocity. Being a native of the most cold and inhospitable regions of the globe, this animal is chiefly found on the shores of Hudson's bay, Greenland, Spitzbergen, and Nova Zembla, and has been found as far northwards as navigators have explored. The polar bear is dexterous in swimming, and often allows himself to be borne to many leagues distance on detached pieces of ice. He likewise dives very well, but cannot exist for a long period under water. His residence during summer is usually on large islands of ice. This animal feeds on fish, seals, and the carcasses of whales, and sometimes dares to attack the morse, notwithstanding the enormously large tusks of that formidable animal. The white bear produces two young ones at a birth, and is very remarkable for attachment to her offspring, which she will on no account whatever abandon. The flesh of this species is white, and said to be similar in taste to mutton, while that of the feet is medicinal. Train-oil is prepared from the fat of this species.

Spec. 4. *Gulo.* Glutton.—*Char.* Body reddish-brown; middle of the back black.

This singularly voracious animal varies a good deal in colour, being sometimes found black, with a ferruginous lateral band, and often of a chesnut colour. In size it exceeds a badger, measuring almost a yard in length from nose to tail, while the tail itself is a foot long. It is indiscriminate in the choice of its prey, in the pursuit of which it has strength and ferocity enough to contend even with the wolf and the bear. The appetite of this animal is doubtless very great, but has been much exaggerated. As most animals, the beaver excepted, are too swift for this animal, it commonly waits its prey on the branches of trees, and is sure to dart effectually on the rein-deer, or any other animal that may pass, whose blood it sucks, and then proceeds to gorge itself with the carcase. It is called the *beaver-eater* in America, from the circumstance of its preying so very much on that species. Though extremely ferocious, this animal is capable of being domesticated. It inhabits the northern regions of Europe and Asia, and is likewise common about Hudson's bay, Canada, and other quarters of North America. The glutton is chiefly sought after on account of its skin, which has a peculiar lustre. It would appear that the wolverene (*Ursus luscus* of Lin.) is a variety of this species.

Spec. 5. *Meles.* Badger.—*Char.* Body grey, with the throat, breast, belly, and tail black; longitudinal black stripe including the eyes and ears, which are small; body thick, and legs short; tail six inches long, and covered with long hair.

This species, which is covered with long bristly hairs, is generally about two feet and a half in length, and its weight varies from fifteen to thirty pounds, or upwards. An extraordinary variety has been described, which is white, with brown and reddish patches. The badger abounds in Europe and Asia, and is by no means uncommon in England. In woody tracts it forms for itself a subterraneous retreat, having different apartments, and to this abode there is one entrance only from the surface. Like the bear, this animal confines itself, in a half torpid state, during the winter season. Though too slow in its motions to avoid an adversary, the badger is peculiarly qualified for its own defence, and its bite is very severe. As it feeds chiefly in the night-time, this animal rarely ventures abroad during the day, being averse to the light. Badgers, though vicious in their own defence, are otherwise comparatively harmless, feeding on insects, fruits, and roots, the honey of wild bees, young birds and eggs, and rarely attacking larger animals than a frog or lizard. With proper treatment, they become so familiar as to follow their keeper, or play with dogs; and, when domesticated, they take almost any kind of nourishment, become fat, and are much addicted to sleep. They are tenacious of life, but are easily killed by a blow on the snout. It is very remarkable for cleanliness; and the fox, taking advantage of this circumstance, deposits his soil at the entrance of the badger's hole, which is so offensive that he is forced to seek a new retreat. The skin of the badger is employed for pistol furniture, and for pendant pouches for the Highland soldiery, while the hairs are formed into painters' brushes, which are well adapted for softening the shades in painting, and thence called *sweetening-tools.* The flesh of these animals is used as food by the Chinese.

Spec. 6. *Lotor.* Racoon. *Char.*—Tail ringed; a black stripe across the eyes.

The racoon is about the size of a small badger, and in his visage very much resembles the fox. He is sometimes known by the name of the Jamaica rat, and measures in length from nose to tail about two feet, and the tail is nearly one. The body is broad, and of a dark grey colour, back arched, and limbs comparatively short, particularly the fore ones. The racoon abounds in North America and the West Indies, and lives very much on maize, fruits, eggs, birds, and shell-fish. It feeds chiefly in the dark, sleeps from noon to midnight, eats in a sitting posture, and delights in sweetmeats and ardent liquors. This is a very nimble animal, and, by means of its sharp claws, climbs trees with great facility. In the domestic state, it evinces much of the restlessness of the monkey tribe, and is very minute in the examination of every thing. With persons to whom it is familiarized, it is sportive and playful. Of the skins of this species are formed gloves and upper shoe-leathers, and the fur is valuable in hat-making.

Genus 5. *Didelphis.* Opossum.

Char.—Ten superior and eight inferior cutting teeth; tusks long and pointed; tongue ciliated: tail long and prehensile: some of the species furnished with a pouch for containing their young, and others with a folding of the skin for that purpose. Nineteen species belong to this remarkable genus.

There are several varieties of the opossum found in various quarters of the globe, notwithstanding the assertion of Buffon, who limits it to the New World only.

The greatest peculiarity in the history of this animal is the pouch or bag formed under the belly of the female, into which she receives her young soon after birth, and when they are suckled, till they arrive at sufficient maturity to endure the open air. This opens by a kind of slit about three inches long, which at other times is so completely shut that it can scarcely be perceived. This bag is lined with hair, and contains the female teats, and she possesses the power of opening or closing it at pleasure. This seems intended by nature for their defence till they attain a certain degree of strength. Some days after birth they venture forth to amuse themselves, but immediately fly to this retreat when alarmed or in danger. When the bag is opened, the young ones may be seen attached to the teats of the female, as firmly as if they were part of herself, and they drop into this bag after they are suckled for some days. Of this species there are some that carry their young on their backs, and cover them with their tail.

Spec. 1. *Virginiana.* Common Opossum.—*Char.* Head long; mouth wide; tail naked, except at the base, where it is hairy; legs short and black; toes furnished with sharp claws.

This species, from the erect growth of its fur, seems thicker in body than a cat, and is commonly of a dingy white, or rather greyish colour. The abdominal pouch is strikingly marked in this species, and the young ones instinctively lodge themselves, or are placed into it by the parent animal, who thus carries them about with great fondness. For the bringing forth of her young, the female prepares a nest of grass, and in this she produces from four to six at a litter. The common opossum feeds on roots and fruits of different kinds, but is carnivorous, preying on poultry and small birds, sucking their blood, but not eating their flesh. It seems a very helpless animal; but though incapable of exerting itself in running, it is extremely agile in climbing trees, and takes advantage of its prehensile tail in the manner of a monkey. Such is the cunning of the animal, that, when pursued, it affects being dead, until the danger ceases; and it is said that the female, with the young in her pouch, will submit to be roasted alive rather than give up her offspring. The opossum has a grunting sort of cry, and an ungrateful scent, but is pacific and readily tamed. For tenacity of life, it is more proverbial than the cat. The Indians prefer its flesh to that of pork, and it is said to be white and well flavoured.

The *Sarohe*, or *Gamba* of Brazil, is about the size of a cat, and formed like a rat, with a most forbidding aspect, and nauseous smell.

Spec. 2. *Dorsigera.* Merian Opossum.—*Char.* Teats six in number; tail half naked.

Madame Merian describes this species in her work on the Insects of Surinam.

The *wombat*, found on Furneaux island, and the mountains west from Port Jackson, seems to have some affinity to the opossum, though it does not rank as one of the species, on account of its teeth, which are different. From the tip of the nose to that of the tail it is two feet seven inches long, and the body is covered with a coarse cinerous brown hair, which is thickly set on the rump and loins, and on the head and back. The wombat of the mountains ventures abroad only at night, but that of the islands is found to feed chiefly on grass in the day time. Though fierce in its own defence, this animal is naturally harmless and pacific. Sir Everard Home possessed a male one for about two years, which seized every opportunity of digging in the most dexterous manner into the ground, and covering itself with earth. It was perfectly sensible of obliging treatment; averse to cold, and remarkably fond of new hay, but took any kind of food. During the night it continued always in motion, but was inactive through the day.

Genus 6. *Dasyurus.*

Char.—Eight upper and six under cutting teeth; tusks of a middle size; upper jaw longer than the lower; snout pointed; body slender; tail long and bushy; five separate toes on each foot; thumb on the hind feet very short; no abdominal pouch on the female.

This genus, instituted by M. Geoffroy, includes several species resident in New Holland, and which are all herbivorous. These, however, Dr Shaw includes under Viverra and Didelphis. The six species enumerated are distinguished by their colour. Another new genus, called Perameles, formed by M. Geoffroy, comprises the *Didelphis obesula* of Shaw, as well as another species not formerly described.

lassification

Maculatus. Spotted Opossum. Of this species the characters are exactly those of the genus. The usual colour is black, with irregular roundish patches of white.

Genus 7. *Macropus.* Kanguroo.

Char.—Six front teeth in the upper jaw, two long and sharp pointed ones in the lower, five grinders on each side of both jaws; hind legs about the length of the whole body; five toes on the fore feet, on the hind three, all armed with strong sharp claws; tail lengthened; abdominal pouch in the female.

Dr Shaw, and others, very properly separated this genus from the Didelphis tribe, with which it was previously confounded. The kanguroo, together with the platypus, is assuredly the most remarkable of all the animals brought from the continent of Australasia. There are two species.

Spec. 1. *Giganteus.* Great Kanguroo.—*Char.* brown; ears sharpish; feet five-toed.

The kanguroo was first discovered in Botany Bay, in 1770, by Cook. Some specimens have been found almost nine feet long, and weighing more than 150 lbs.; but the ordinary size is that of a full grown sheep. The head is small and taper, and countenance placid; eyes large, mouth small, neck slender; and the circumference of the animal increases gradually downwards, being thickest near the rump. It has very short fore legs compared with the hind ones, which are upwards of three feet long in the largest individuals, and also bare and callous. In sitting, the rump of the kanguroo is raised several inches, as its body rests on the whole length of the hind legs. In cases of emergency it is supposed to go on all fours, though the fore feet, it would appear, are chiefly employed in digging and bringing food to the animal's mouth. The pouch of the female is large and deep, and resembles that of the opossum. She produces one at a time, which is observed to be so small at first as to weigh not more than 21 grains. The young one, after having quitted its maternal retreat, continues long after to take occasional refuge in it. The kanguroo rivals the greyhound in swiftness, having been observed in its course to leap over twenty feet at a bound. In its defence the tail of the animal constitutes a most formidable weapon; besides which, it seizes its opponent with the nails of its fore paws, and strikes with those of its hind feet. It feeds on grass and vegetables, and drinks by lapping. In the wild state this species feed in herds of thirty or forty, one of their number being generally stationed apart on guard. The flesh of the kanguroo is said to resemble coarse mutton. Its fur is soft, and of an ash colour, inclining to whiteness on the breast and belly.

The lesser kanguroo, or kanguroo rat, is of the size of a rabbit, with the tail long, tapering, and hairy. It is gentle and harmless, feeds on vegetables, and burrows in the ground. Its head resembles that of a rat; the body is brown, with the belly ash-coloured; the ears are rounded; feet four-toed, and the hind legs exactly like those of the great kanguroo. This species has likewise an abdominal bag for the defence and protection of its young.

Genus 8. *Talpa.* Mole.

Order III.

Char.—Six unequal front teeth in the upper jaw and eight in the under, one canine tooth on each side; seven grinders in the upper jaw and six in the lower; head long and furnished with muscles; snout moveable; hands broad, and having pointed claws; fore legs strong and short. Seven species are enumerated.

The mole is a very singular animal, and materially differs from every other quadruped both in its figure and habits. With a nose somewhat like the hog, it is in size between the mouse and the rat, with two small orifices in place of ears, and the eyes are so very small that naturalists formerly believed it had none.

Spec. 1. *Europœa.* Common Mole.—*Char.* Body of a black colour; feet five-toed; tail short.

The mole is admirably adapted for the mode of life to which it is destined, and has the senses of hearing and smelling remarkably acute; so that on the least surprise it instantaneously effects its escape. The peculiar construction of its fore-feet qualifies it astonishingly for making its way in the earth; and it is most common in grounds where the soil is loose and soft. The doubts formerly entertained by some naturalists, respecting the eyes of this animal, have been set at rest; it having been demonstrated, by dissections, aided by the microscope, that the eyes of the mole are perfectly formed, and adapted for accurate vision. By the simple experiment of putting a live mole into water, the eyes appear distinctly like two exceedingly small dark shining points. The mole feeds on worms, snails, and insects. Its retreat is commonly five or six inches under the surface of the ground, and consists of a commodious apartment, to which there are several different passages. The earth which occasionally incommodes it in the forming of this subterraneous abode, the animal throws up by means of its head and nervous paws; and hence originate those small heaps of mould so general in fields and gardens. These heaps are but rarely thrown up in very dry weather, but are increased immediately before rain, or before a thaw in winter. The mole resorts to hillocks and flat lands in summer, but repairs to elevated grounds in winter, to avoid the danger of floods; and mole-hills are said to have been seen at the height of 2000 feet above the level of the sea. It is qualified to swim over brooks and small streams, but does not hybernate, except, perhaps, in the more northern regions of the globe. Four or five young ones are produced by the female in spring, which continue quite naked and red until they attain a certain size. Buffon supposes that a second brood is not uncommon. So prolific is the species in some countries, that it is said a farmer in Holland caught from 5000 to 6000 within the year 1742. The mole, when surprised, utters a shrill cry, and prepares to defend itself with its teeth and claws. The Arabs make use of the flesh of this creature for food; but the skin is of little value, owing to the difficulty of manufacturing it. In hat-making, however, the fur is of some importance. M. de la Faille mentions four varieties of them, the white, the tawny, the greenish or citron-coloured, and the spotted.

Spec. 2. *Radiata.* Radiated Mole.—*Char.* Body black; feet white; the edges of the nose surrounded with radiated tendrils.

This species is not so large as the common mole, from which it is chiefly distinguished by the peculiar appearance of its nose. It is the *Sorex cristatus* of Linnæus; feeds on roots, and is common in North America.

The Siberian mole has a very short nose, with only three toes on the fore-feet, the two exterior being furnished with a very large claw, but the hind-feet have four toes each, and it is destitute of a tail. The body is of a beautiful green and gold colour; and it is a native of the Cape of Good Hope.

Genus 9. *Sorex.* Shrew.

Char.—Two long front teeth in the upper jaw, from two to four in the lower, the intermediate ones shorter; grinders with sharp protuberances; several canine teeth on each side.

As the species of this genus, seventeen of which are enumerated, bear a striking resemblance to those of the former, it is chiefly owing to their habits and the disposition of their teeth that they occupy a separate place.

Spec. 1. *Musaraneus.* Common Shrew, or Shrew Mouse.—*Char.* Body of a rusty-brown colour, but whitish beneath; tail rather shorter than the body.

This species, which is very common, is generally two inches and a-half in length, from the nose to the base of the tail. It is remarkable for a strong smell of musk and a shrill disagreeable voice, and inhabits fields and gardens as well as stables, out-houses, old walls, and the like. Its food is insects, corn, and offals. The female produces five or six at a litter, and is thought to breed twice in the year. Cats are observed not to eat the shrew, though they kill it. From the circumstance of many of this species being usually found dead in the highways and fields about the month of August, it would seem that they are subject to an yearly mortality. Absurd prejudices were formerly entertained by the vulgar respecting this species, as it was considered to have the most baneful influence upon horses and cattle, and to communicate diseases among them by means of its supposed poisonous teeth, though in reality these creatures are incapable of biting.

Spec. 2. *Bicolor.* Water Shrew.—*Char.* Body blackish, with the belly cinereous; tail rather naked, and of a medium length; toes fringed.

This species, which is also known by the name of the *Fen-mouse,* is nearly four inches in length, and the tail measures two inches long. Its voice is similar to the chirp of a grasshopper. The water-shrew is very capable of swimming, and is found about swamps and rivers in Europe and Siberia. Nine young ones are brought forth by the female at a time. There is another species, the *Minute Shrew-mouse,* which is the least of all quadrupeds. The head and back are grey, and the under parts of the body white; the head is nearly as large as the body; and it burrows under trees, and is a native of Siberia. There are several other varieties of this species found in almost every country, both of the old and new continents.

Genus 10. *Erinaceus.* Hedgehog.

Char. In each jaw six cutting teeth, the middle ones being longest; tusks not so long as the incisors; covered with strong short spikes, or prickles, and capable of being rolled up like a ball; tail short; nose formed like that of a hog.

Spec. 1. *Europæus.* Common Hedgehog, or Urchin.—*Char.* Nostrils crested, and having a round flap; ears rounded; spines sharp pointed, and about an inch in length.

This species inhabits different parts of Europe and Asia, and is also found in some parts of Africa. Its only means of security from its various enemies is its spinous armour; and, in cases of danger, it merely rolls itself closely together, and thus patiently submits to its persecutors, whatever cruelty may be inflicted. Exclusive of its tail, the hedgehog is ten inches in length, and the tail, being not more than an inch long, is hid by the bristles. It is a nocturnal creature; lives in woods, fields, and gardens, and becomes torpid in winter. When put into water, it swims with facility. Its nest is commonly large, and composed of leaves and moss. Four or five young ones are produced by the female at a time. This offenceless animal has been erroneously accused of sucking cattle, and pilfering fruit,—practices for which it is obviously incapacitated by nature. The hedgehog has been often domesticated, and has been usefully employed in extirpating *blattæ,* or cock-roaches. The ancients are said to have used its skin as a clothes-brush. Its flesh is esteemed a delicacy by the Spaniards, but despised in other countries. Albertus Magnus had the consummate folly to prescribe, as a means of qualifying one *to see perfectly in the dark,* an ointment consisting of the hedgehog's right eye fried in oil.

The Striped Hedgehog of Madagascar is a peculiar species, having the body banded longitudinally with black and white, and its snout long and sharp pointed. Likewise the *Auritus,* or long-eared hedgehog, is remarkable for its long oval ears. Besides the foregoing, may be mentioned the Asiatic hedgehog, which is without external ears, and has very long and flexible hairs. This latter is less in size than the common kind, being not larger than a mole, and never rolling itself up when attacked. It is also found in Guiana.

ORDER IV. GLIRES.

Char.—Feet clawed, and formed for running and leaping; two large and very long cutting teeth in each jaw; canine teeth none: feeding on vegetables. This order consists of ten genera.

Genus 1. *Hystrix.* Porcupine.

Char.—Body covered with very sharp spines; four toes on the fore feet, and five on the hind; two front teeth obliquely cut in both jaws; eight grinders.

The species are six in number. Were the form and disposition of the teeth not dissimilar, the hedgehog, in respect of its external characters, might be classed with the porcupine: it however belongs to the order Feræ.

Spec. 1. *Cristata.* Common, or Long-spined Porcupine.—*Char.* Crested head, and short tail; toes armed with strong crooked claws.

This remarkable animal, though of a ferocious aspect, is comparatively harmless, and its variegated spines, or quills, are merely defensive. The quills, which are long and sharp pointed, are more lengthened towards the hind part, measuring from about ten to fifteen inches. Strong bristles and hair cover the belly and legs; and on the top of the head there is a long crest, composed of strong bristles, inclining backwards. Each quill is thickest in the middle, and inserted in the skin of the animal like the feathers of a bird. It has long whiskers; the nose is blunt; ears resembling the human; upper lip divided; and tail about four inches long, and covered with short and rather blunted quills. Though chiefly a native of Africa, India, and the Indian islands, it is found in Malta, Sicily, and other mild parts of Europe. When attacked by an enemy, it has the power of erecting its quills, and was long thought also to have been capable of darting these to some distance,—a mistake probably arising from the appearance of the animal in the moulting season, when the quills are detached, and often darted to some small distance. The porcupine subsists chiefly on roots and vegetables, but is supposed also to devour serpents and reptiles. It retires under ground, and sleeps through the day, and therefore ranges for food during the night. One is commonly produced at a birth, and the female goes seven months with young.

Spec. 2. *Prehensilis.* Prehensile Porcupine.—*Char.* Feet four-toed; spines short; prehensile tail, long, and barely covered.

This species is chiefly found in Brazil, and the warmer parts of the American continent. It inhabits woods, feeds on birds as well as vegetables, and climbs trees, on the branches of which it clings by means of its strongly prehensile tail. In the daytime it sleeps in the hollows of trees, or excavations under ground, and in other such places. It is almost a foot long, with a tail about eighteen inches; and, except on the belly and inside of the limbs, it is defended with strong quills, finer and sharper than those of the former, but not longer than three inches, and which are barred with black at the points. About a third part of the tail is covered with spines.

Genus 2. *Cavia.*

Char. Two wedge-shaped cutting teeth in each jaw, eight grinders; four or five toes on the forefeet, and from three to five on the hind; very short tail, or, in some species, none.

Spec. 1. *Cobaya.* Variegated Cavy, or Guinea-Pig.—*Char.* Body white and black; no tail.

This well known and easily domesticated creature is an inhabitant of South America. It is delicate, but astonishingly prolific, and attains its full growth in eight or nine months. Feeding on vegetables, it is very partial to parsley and fruits, and its flesh is edible. When alarmed, the guinea-pig makes a sharp cry; but when satisfied, it utters a chirping sound. These creatures often dress each others fur, and appear always extremely clean. Buffon calls this species the Indian pig.

Spec. 2. *Aguti.* Aguti.—*Char.* Body thicker behind than before; reddish-brown body, paler beneath, and inclining to yellow; of the size of a rabbit; tailed; head small, and compressed laterally.

This species abounds in Guiana, and in the warmer regions of South America, where it inhabits the woods, living in the clefts of rocks and hollows of trees, feeding on nuts and other fruits. It moves very swiftly, not unlike a hare, grunts like a pig, and holds its food in its paws. Great numbers are caught by the Indians, by imitating their voice, and by means of traps and dogs.

Genus 3. *Castor.* Beaver.

Char.—Grinders on each side four; cutting teeth four, truncated in the upper jaw, and in the lower transverse at the tips; tail long and scaly. There are only two species.

Spec. 1. *Fiber.* Common Beaver.—*Char.* Chesnut-coloured; tail somewhat flat, oviform, and scaly.

The beaver is a most singular creature, endowed with a surprising degree of art, which it exhibits in the construction of its habitation. In its external form it resembles the rat, but is much larger, being generally three feet in length. Its tail, by which it is peculiarly characterised, is about one foot long, and of an oval form, covered with scales, and serves to direct the animal's course in the water. Though commonly of a chesnut-colour, the fur is sometimes white, cream coloured, black, or spotted. This animal, which was at one period found in Britain, is most prevalent in the remote parts of North America, and is also to be met with in most of the northern parts of Asia and Europe.

So very remarkable is the instinct of the beaver, that its various and complicated labours appear in a great measure like the result of reason and social compact. These industrious creatures generally assemble in separate parties about the month of June or July, and form a body of from 200 to 300, for the purpose of effecting a settlement on the bank of some lake or stream. Should they fix on a river or brook, they obviate the inconvenience of its rising or falling by the judicious construction of a bank across the water, and this is sometimes more than ten feet thick at the base, while its extent is nearly 100 feet—a seemingly incredible piece of work for such puny architects. In choosing the spot for their preliminary labours, they always endeavour to avail themselves of a large tree close at hand, the fall of which they readily effect by gnawing with their teeth. This done they bring down the small trees in the same manner; and the branches being lopped off, all the trees are floated down towards the site of the proposed mound. The large tree forms the basis of their work, and the smaller ones are cut into stiles sunk into the ground and interwoven with branches. During this process, many of them are busied in bringing quantities of earth in their mouths for the fixing of the sunk piles; and thus, by their individual efforts, the work is erelong constructed in such perfection as to bear the pressure of the water. The abodes of these sagacious creatures are reared on stakes with an opening to the land and another towards the pond. They are circular or oval, from four feet upwards in diameter, and sometimes consist of three or four stories, the walls of which are about two feet thick, constructed in a most substantial manner, and plastered neatly with clay. These dwellings are arched at top, like an oven ; are proof against wind and rain ; and more than twenty of them are at times contained in one establishment. A separate apartment is allotted to each family, into which strangers are denied admittance. The number of inhabitants in the larger dwellings may be from 18 to 20, and even 30. The lowermost apartment is generally full of water, the next is for their habitation, and the third for a retreat in case of an overflow or rising of the water. Each cabin has its own store of food, proportioned to the number of inmates. In this populous colony internal concord is uniformly experienced ; and on the approach of danger the whole republic is at once on the alert, the alarm being announced by a plashing of tails in the fluid element. Two or three young are commonly produced at a birth in the end of winter, which in a few weeks are capable of following their dams. The flesh of the beaver is said to have a fishy taste. The animal is sought after about the close of winter, for the sake of its skin, the fur being then in its greatest perfection ; and from the inguinal gland of the beaver is produced that valuable drug *castoreum*, or castor, contained in bags or follicles, and it is much used as an excellent antispasmodic in histeric complaints. See MATERIA MEDICA.

Spec. 2. *Huidobrius.* Chili Beaver.—*Char.* Two strong cutting teeth in each jaw, grinders same as in common beaver; head somewhat square; eyes small; ears short, and rounded; length from nose to tail about three feet.

This species is very ferocious, and capable of living for a considerable length of time under water. Its body is broad, and clothed with two kinds of hair, the finest of which is very soft, and employed in cloth and hat manufactures. The Chili beaver, known in that country by the name of *quillino,* feeds on crabs and fish, and is found about the rivers and lakes of South America. From two to three are produced at a birth. This species affords no castor; neither does it construct dwellings like those of the common beaver.

Genus 4. *Mus.*

Char.—Two or three grinders on each side, upper front teeth wedge-shaped; ears short, and rounded ; clavicles in the skeleton.

All the species of rats as well as mice are included in this genus. These are commonly very swift, and many of them are amphibious. During the day they conceal themselves in holes, and consequently search for their food, which consists mostly of vegetables, during the night. Some of them have cheek pouches for carrying food to their receptacles. The species are numerous, remarkable for fecundity, and found in most parts of the world. Dr Shaw arranges them into five sections: 1. Those having the tail compressed at the end; 2. Such as have the tail round and naked; 3. Having the tail round and hairy; 4. Having cheek-pouches; 5. Including those with small eyes, tail short, or none, and ears wanting.

SECT. I. *Tail compressed.*

Spec. 1. *Zibethicus.* Musk Rat.—*Char.* Long, compressed, lanceolate tail; feet unwebbed ; colour rusty brown.

The musk rat, so called from the peculiar oily fluid secreted in it, builds its habitation in a simple manner on the banks of streams in North America, and feeds on shell fish, herbs, and roots. The female brings forth from three to six at a time.

SECT. II. *Tail round and naked.*

Spec. 1. *Decumanus.* Norway Rat.—*Char.* Body light brown, mixed with tawny; breast and belly dirty white ; stiff haired ; tail long and scaly.

This remarkably fierce creature will turn and fly at its pursuers, and, from the sharpness and irregularity of its teeth, inflicts a severe and most painful wound. As the name denotes, it is originally from Norway. In granaries, houses, and ships, it is well known as a predatory and dangerous inmate. It feeds on frogs, fish, and small animals during summer, for which it lurks about the banks of ponds or rivers; and it is destructive of corn, fruits, rabbits, and other small animals. Dogs, ferrets, and cats, are formidable opponents of this creature, the increase of which is however prodigious, as the female breeds generally three times a-year, and brings forth from 12 to 18 at a time.

Spec. 2. *Rattus.* Black Rat.—*Char.* Body black, except beneath, where it is hoary or ash-coloured ; tail scaly, and about eight inches long.

This species, originally from the east, is perhaps more prolific than the Norway rat, and would soon be extremely destructive were it not for the fortunate circumstance, that, when they become very numerous, they attack one another so furiously that they have been frequently known on this account to leave their haunts and disappear very suddenly. They generally measure seven inches in length from nose to tail.

Spec. 3. *Musculus.* Common Mouse.—*Char.* Fore feet four-toed, and hind five-toed ; body brown, but ash-coloured beneath ; tail long and naked.

This is a most lively active animal, and, excepting the Guinea-pig, the most timid in nature. All its actions seem to originate from fear or necessity. It would never leave its hole were it not for the purpose of procuring food, and it seldom ventures out farther than a few paces. It abounds in Asia, Europe, and America, living in houses and granaries, and using any kind of food. Among its deadly foes are hawks, serpents, weasels, hedge-hogs, cats, and owls. As an instance of the astonishing fecundity of the species, Aristotle affirms that, from one pregnant mouse put into a vessel of corn, he shortly after found 120. Its usual term of life is said to be two or three years, and it is capable of being tamed. A few of these little animals were lately employed at Dunfermline in Scotland, in the same manner as the turnspit dog, for turning a small spinning cotton mill, at which each of them was said to earn about five pence per week. But the ingenious gentleman who contrived to employ the activity of these little creatures in this operation, found, of course, the produce of their labour to be rather curious than profitable.

Spec. 4. *Sylvaticus.* Wood Mouse.—*Char.* Body yellowish-brown, and white beneath ; tail long and naked. One variety of this species is white, with red eyes.

The wood mouse is common throughout Europe, feeds chiefly on corn and seeds, and in winter relinquishes the gardens, fields, and woods for the habitations of man. It is capable of gnawing the hardest timber. Foxes, weasels, and hawks destroy it.

SECT. III. *Tail hairy and round.*

Spec. 1. *Cyanus.* Blue Rat.—*Char.* Body blue, but whitish beneath ; fore feet four-toed, and hind five-toed ; tail longish and somewhat hairy.

Spec. 2. *Amphibius.* Water Rat.—*Char.* Body thick and short, and in shape approaching to the beaver ; dark brown, with the belly ash-coloured ; ears very short ; tail nearly half the length of the body. This species is about seven inches long, but varies much both in size and colour. It never frequents houses, but continually resides on the banks of stagnant waters or rivers, and feeds on frogs, fish, vegetables, and insects.

SECT. IV. *Cheeks with Pouches.*

Spec. 1. *Oricetus.* Hamster Rat, or German Marmot.—*Char.* Body reddish-brown, with three white spots on each side, and the belly black ; ears large, and rounded ; tail short.

This species, which in size, strength, and ferocity exceeds the *Decumanus*, is so prolific, breeding several times a year, and producing six or seven at a time, that they would soon overrun the countries they infest, did not their determined fierceness of disposition occasion a considerable reduction of their numbers. Such, indeed, is their savage nature, that they not only destroy and devour their own species, but likewise attack every animal that approaches them, being neither intimidated by the address of the dog nor the formidable aspect of the horse. They are most common in Germany, Austria, and Silesia. In size the male considerably exceeds the female, weighing twelve or fifteen ounces. When filled, the cheek-pouches appear like woollen bladders, and are said to hold about three ounces of grain. Should an enemy appear in pursuit of one of these animals, it prepares for the attack by emptying the cheek pouches, and blowing them up till the dimensions of the head and neck exceed very much those of the rest of the body, when, raising itself on its hind legs, it darts viciously on its foe. Buffon states, that if one of them should seize a man's hand, it must be killed before it quits its hold ; and that when two of them meet, they never fail to attack each other, when the stronger always kills and devours the weaker.

By the rapid accumulation of their numbers, the hamsters have been known to cause a sensible scarcity of grain, so that premiums were granted for destroying them. Subterraneous vaults are formed by this species at the end of holes or passages ; and in these vaults are planned separate apartments, for lodgings, and for receiving the stores of provisions, consisting chiefly of corn, peas, and beans, which they lay up in autumn. The diameter of one of these vaults, including all communications to it, may be about eight feet or more. To this under-ground dwelling, one aperture descends in an oblique direction ; and another, which is expressly designed for ingress and egress, has a direct ascent. The main lodging is commonly lined with dried grass. During the winter season, the hamsters, being in a state of torpidity, are frequently dug out of their holes for the sake of their furs, which are of some value.

So extremely pernicious is this species of vermin, and so very troublesome, particularly to grain-dealers and agriculturists, that rat-catchers have been offered great rewards, and have exercised all their ingenuity, to effect their destruction. Among the best means invented for this purpose is a mixture, composed of a small quantity of *nox vomica* finely powdered, and mixed with a quart of oatmeal, a pint of boiled potatoes, half a pound of brown sugar, and as much new milk as is sufficient to form the whole, when mixed, into a paste. When made up into pills about the size of large pistol bullets, and placed in their paths for a few nights, these will, it is said, produce the desired effect, especially if mixed with a small quantity of oil of rhodium. Quick lime, slowly administered, is known to destroy them. Fried cork is also used for that purpose.

But although the destruction of rats is, in some instances, effected by poison, yet, owing to the peculiar caution of these animals, which induces them to avoid any thing touched by the hands of man, the application of poison, exclusive of the danger of it, often proves ineffectual. Those, therefore, that follow rat-catching as a profession, carefully examine the places frequented by the vermin, and the food they consume. They next stop their progress in some places, and direct them, by trains laid, to other apartments, where they are supplied with wholesome and grateful food, of which they eat but sparingly at first. By degrees they next stop up their path to other places, till they bring all the rats to consume the food left in one particular spot without fear, where they will all assemble, at length, without any apprehension. When they have been thus fed for some days, they stop up all the passages but one through a door or other aperture ; so that, by holding a bag to this opening, they may be wholly caught at once, and drowned, or otherwise destroyed. To extirpate them in this manner will, no doubt, require the greatest possible caution and circumspection, as well as patience and application.

The common steel spring-trap is likewise successfully used for their destruction, if carefully baited with roasted cheese or grease, and well covered over with chaff, dried leaves, or other materials.

Spec. 2. *Phæus.* Astrachan Mouse.—*Char.* Body of an ash-brown colour, and white beneath. This species burrows under ground, lays up provision for the winter, and is migratory.

Spec. 3. *Songarus.*—Of the same colour as the former, but spotted white on the sides, and having a spinal line of black. In their marches this migratory species suffer no object to impede their progress or turn them from their course ; in which respect they resemble the lemmings.

SECT. V. *Earless; Eyes small; Tail short, or none.*

Spec. 1. *Maritimus.* Coast Rat.—*Char.* Teeth large and long; body brown, inclining to yellow, and whitish below; feet five-toed; subterraneous.

Spec. 2. *Typhlus.* Blind Rat.—*Char.* Without eyes; tailless; fore-teeth broad; fore feet five-toed.

This wonderful animal is found in Northern Russia, where it burrows beneath the turf. Its apparent want of sight is, in a great degree, compensated by its very acute susceptibility of hearing, touching, and smelling. The rudiments of eyes appearing in it are very small, and covered with a skin.

With the view of describing other two species of *mus*, and likewise including the coypou, a new genus, *Hydromys*, has been instituted by Geoffroy, with these characteristics, viz. Two cutting teeth in each jaw; two grinders both above and below, furrowed, and having a double excavation; tail round, with short hair; fore feet three-toed, and hind ones webbed.

Coypus. Coypou, or Beaver Rat.—*Char.* Body of a black chesnut colour, with the flanks red, and abdomen light brown.

Molina speaks of this creature as being a water rat, similar in size and colour to the otter; but it is described by Geoffroy as fourteen inches long from nose to tail, and having a tail two inches in length, the hair of which is thin, stiff, and short. It has long and stiff whiskers, and is of a whitish colour about the extremity of the muzzle. The animal abounds in the Plata, about Buenos Ayres, and in the waters of Chili and Tucuman.

Genus 5. *Arctomys.* Marmot.

Char.—Clavicles in the skeleton; grinders five on each side of the upper, and four in the under jaw; front teeth wedge-shaped, strong and sharp, and two in each jaw; ears short, or wanting; hind feet five-toed; tail short and villous.

The marmot is of a thick form of body, with the head large, roundish, and rather flattened. It is a diurnal creature, living in holes, feeding on grain and roots, and sleeping through the winter. Eight species are enumerated.

Spec. 1. *Marmota.* Alpine Marmot.—*Char.* Body brown, but reddish beneath, and measuring sixteen inches in length without the tail, which, of itself, is nearly six inches long.

This species feeds on insects, plants, and roots; and, being peculiarly adapted for climbing rocks and mountains, is found in the more elevated regions of Switzerland and Savoy, as well as the Pyrenees and Alps. Three or four are usually brought forth by the female in the summer season. When young, the marmot is very susceptible of being tamed and instructed. It relishes milk, but takes any kind of animal or vegetable food, which it eats by the assistance of its paws, sitting at same time in an upright posture. The Alpine marmots contrive, for their residence, in the declivities of high mountains, a hollow of an oval form, lined with moss, and having a spacious passage, artfully designed, so as to present two outlets, the one of which, sloping downwards, serves as a drain, while the other is the avenue by which they go out and in. About this place the creatures delight to sport together in fine weather; on which occasions one of the society acts the part of centinel, and announces the sudden appearance of an enemy by a shrill loud whistle, which instantly impels the whole body into the common abode. Preparatory to their assuming the torpid state, they close up the entrances of their caverns for the season. When dug up in the winter, they have been found to recover from sleep by means of warmth; but if too hastily exposed to the heat of the fire, they are apt to die.

Spec. 2. *Empetra.* Quebec Marmot.—*Char.* Body grey, and finely shaded, and having the legs and belly of a reddish colour, and the tail dusky.

Genus 6. *Sciurus.* Squirrel.

Char.—Two cutting teeth on each jaw, the upper ridged, and lower compressed; grinders, five upper, and four lower, on each side; clavicles; tail long, and generally spreading.

The squirrel is a wonderfully nimble and docile little animal, and its movements and general appearance render it peculiarly pleasing. Like the rabbit and hare, it generally sits on its hind legs, and uses its fore paws in conveying its food to its mouth. Its eyes are very lively and sparkling; and, by means of an expansile lateral skin, some of the species can bounce from tree to tree, and have thus, though incorrectly, been denominated flying squirrels. Inhabiting woods, the animals of this genus feed on vegetables, and build in hollow trees. About twenty-six species of them are included in two divisions.

SECT. I. *With Climbers, but no Flying Membranes.*

Spec. 1. *Maximus.* Great Squirrel.—*Char.* Ferruginous; with the belly yellowish, and the outsides of the limbs and tail black; fur long and full.

This being of the size of a cat, is considered the largest of the species, and is indigenous to India. It feeds on fruits and the juice of the cocoa-nut. M. Sonnerat states, that it is tameable, and common in the Malabar country, where it is styled the great wood rat.

Spec. 2. *Vulgaris.* Common Squirrel.—*Char.* Reddish-brown, with the belly white, and ears pencilled; tail remarkably lengthened, and covered horizontally with long hairs.

The squirrel, in form, resembles the rabbit, although less in size. It has very short ears; and its tail, which is generally erected over the back, serves for the purpose of screening it from the heat or cold, defending it from the rays of the sun, assisting it in leaping from tree to tree, or in crossing a river, when it is used as a sail. In moving from one place to another, these animals, on approaching a river or lake, run back into the woods, and furnish themselves, each with a piece of bark, on which they launch forth, and thus commit themselves to the watery element. This species feeds on birds and young shoots of pine and other trees, and is careful in laying up a store of nuts for the winter. It constructs its nest of moss, between two branches; and the female produces four or five at a litter. In northern climes the colour of the species changes to grey. A varie-

Classification.

Order IV.

ty is found in Wales, having the following characteristics: Eyes black and large; ears, with considerable tufts of hair, darker than that of the body; toes long, and fully divided; nails strong and sharp; legs muscular and short; tail cream-coloured; gullet very narrow, this being intended by nature to prevent them from disgorging their food during the violent exercise to which they are often exposed in leaping down the trees. This creature is very destructive, especially to the common pine and fir, by eating the tender part of the bark near the top, which very speedily causes the tree to die.

Spec. 3. *Striatus.* Striped Squirrel.—*Char.* Of a yellowish-brown colour, with black stripes running lengthwise.

This species is of a wild nature, living in holes under ground, where it passes the winter in sleep, and feeding on grain, acorns, and nuts, with which it provides itself in autumn. It is found in North America, the northern parts of Asia, and different parts of Europe. Though perfectly qualified to climb trees with celerity, it never does so except to avoid danger. Great numbers are taken on account of the skins, which it is said the Chinese are very ready to purchase.

SECT. II. *With a Flying Membrane.*

Spec. 1. *Volans.* Common Flying Squirrel.—*Char.* Of a light grey colour, with the belly white; side skin constituting a flying membrane; body about six inches and a quarter long from nose to tail; tail thickly furred.

The flying squirrel, which is considerably less than the common species, is remarkably handsome and beautiful, and forms its nest of moss in the more elevated hollows of trees. It is covered with dark smooth fur, intermixed with bright grey; is very solitary; and, though not subject to torpidity, seldom quits its nest, except in pleasant weather, when it appears in great activity always about twilight. This animal is very unfond of coming to the ground, but skips from tree to tree with amazing velocity, commonly conveying itself, by one leap, to the distance of twenty fathoms, which it is enabled to do by means of its lateral membrane, and it generally directs its flight downwards. The female is extremely careful of her young, concealing them dexterously in her nest with moss when she leaves them. From two to four are usually produced by her at a birth about the month of May. This species chiefly abounds in Asia, New Spain, and North America, and is found also in some of the northern regions of Europe.

Genus 8. *Myoxus.* Dormouse.

Char.—Grinders four in each jaw; two upper front teeth wedged, lower compressed; whiskers long; tail shaggy and cylindric; ears naked; toes on the fore feet four, on the hind five.

The species of this genus, which are seven in number, skip on their hind legs, feed on vegetables, sleep through the day, and become torpid during winter. They likewise burrow in the ground, hold their food in their paws, and drink by dipping the fore paws in water. They inhabit woods, hedges, and gardens, and lay up stores of nuts, acorns, and beans, for winter food, before the approach of the cold weather.

Spec. 1. *Glis.* Fat Dormouse.—*Char.* Of a grey or ash colour, but white beneath.

This species feeds on acorns and nuts, lives on trees, in the hollows of which it forms its nest of moss and leaves, and is very nimble in skipping from one tree to another. In its general form it resembles the squirrel, and it is said to be remarkable for becoming very fat while in the torpid state. The fat dormouse is a native of the south of Europe, especially France. It is difficult of taming.

Spec. 2. *Muscardinus.* Common Dormouse.—*Char.* Eyes full and black; ears broad, thin, transparent, and rounded; tail hairy, and about two and a half inches long; colour a tawny red, with the throat white.

The animals of this species are more plump than the mouse, and form nests of moss in the hollow of a tree, feeding in an erect posture, and that chiefly on nuts, stores of which are laid up by them for the winter. They are plentiful in England, but are considered as rare, because they venture very little out of their dwellings, and are torpid during winter.

Genus 8. *Dipus.* Jerboa.

Char.—Two fore teeth above and below; clavicles; fore legs short, hind ones long. Six species are described.

Spec. 1. *Sagitta.* Common Jerboa.—*Char.* Of a light brown colour, with the belly white; hind feet three-toed and remarkably long; tail of great length, with subpinnated white and black tip.

This species abounds in different parts of Asia, and is minutely described by M. Sonnini, who saw it in Egypt, and tamed six in an iron cage. According to him, the body is covered with soft hair, and is of the size of a rat, with the head broad and large, somewhat resembling that of a rabbit, and having a stripe of black; nose gristly and white, upper jaw projecting beyond the under; iris of the eye brown; ears large and hairy; fore legs white, peculiarly short, and having five toes, with which the creature burrows or holds his food; tail one half longer than the body, scarcely so thick as a goose-quill, and terminating with a tuft of silky hair. Its posture is erect; it is agile in running and leaping; and, when pursued, frequently springs to the height of six or seven feet at a bound. It feeds on vegetables, burrows like a rabbit, and sleeps rolled together. When taken, it utters a plaintive feeble cry. From some coins of Cyrene, this creature seems to have been known to the ancients, under the appellation of *two-footed mouse.*

Spec. 2. *Jaculus.* Alagtaga Jerboa.—*Char.* Of a light brown colour, with belly white; hind feet remarkably long, five-toed, and furnished with spurs, or additional toes with sharp claws; tail of great length, and having a subpinnated black and white tip.

There are two varieties of this species, one of which, the Siberian Jerboa, in size, colour, and disposition resembles the former, except that each hind foot has a fourth toe, about an inch above the heel.

It is about the size of a rat, and has the thighs crossed with a white line, and the nose encircled with white. The variety denominated the Pigmy Siberian Jerboa, is the same in form, but has a lesser tuft to the tail, and no white circle on the nose. The Alagtaga Jerboa is similar in appearance to the Egyptian. It is extremely alert in digging, for its residence, a large hole, which is come at in a winding direction of some yards extent. It is very provident in laying up stores of herbs and the like; ventures out chiefly in the night-time, and passes the winter in sleep, rolled up with the head between the thighs. Respecting this peculiarly agile creature, Mr Bruce states, that those about Aleppo are thicker made than the African, but lighter in colour, and that the Arabs of the kingdom of Tripoli "make very good diversion with the Jerboa in training their greyhounds, which they employ to hunt the gazel or antelope, after instructing him to turn himself by hunting this animal."

Spec. 2. *Canadensis.* Canadian Jerboa.—*Char.* Upper part of the body yellowish, under part white; fore feet with four toes; hind with five; tail like that of a mouse, and long.

Genus 9. *Lepus.* The Hare.

Char. Two front teeth in each jaw, the upper ones duplicate; a pair of small inner teeth behind the outer; ears long; tail short.

From the motions of the mouth of the common hare, as well as from the formation of the stomach of that animal, it is thought to ruminate; consequently, this genus approaches to the order Pecora. The species, twelve in number, are all herbivorous.

Spec. 1. *Timidus.* Common Hare.—*Char.* Ferruginous; ears very long, and tipped with black; eyes large and prominent; hind legs long, and having strong muscles; tail short.

The common hare is too well known to require particular description. It is one of the most timid and defenceless animals in nature, and is beset with the greatest number of enemies; but the peculiar form and powers of this animal eminently qualify it to evade as much as possible the constant dangers it is doomed to encounter. It possesses a very acute scent, quick hearing, distinct views of every object around it; and its hind legs being long, and having great muscular strength, afford it the most effectual assistance in escaping from the dangers to which it is constantly exposed, particularly in ascending an eminence or a hill. Conscious of the singular advantage it has over its pursuers in this respect, it generally avails itself of it, when in its power, by flying towards the rising grounds. Its numerous enemies, however, rarely allow it to exist for its natural term of life, which is supposed to be about eight years. The hare ventures out chiefly under night in quest of food, and, when it leaves its form, it uniformly goes and comes by the same path. Of its susceptibility of being tamed, Mr Cowper's amusing account of three hares kept by him is a well-known proof; and, among other instances, a very familiar and frolicsome young hare is said to have been possessed by Dr Townson, when resident at Gottingen, which always commenced its playfulness in the evenings, frisking about the room, patting him with its paws, and at times knocking the book out of his hands. In addition to the skins obtained at home, immense quantities are imported from Russia, the fur being valuable in hat-making. A farther account of this species will be given under SPORTS and PASTIMES.

Spec. 2. *Variabilis.* Varying Hare.—*Char.* Of a rusty grey colour, but white in winter; ears tipped with black, and not so long as the head; tail short.

Spec. 3. *Americanus.* American Hare.—*Char.* Body tawny grey, but white beneath; ears and tail tipped with grey; hind legs long; tail short.

Spec. 4. *Cuniculus.* Rabbit.—*Char.* Brown, with the under parts whitish, and having the ears tipped with black; hind legs not so long as the body; tail short, black above and white beneath.

This animal, in a domestic state, is of various colours, black and white, light grey, and mixed. Though much smaller than the hare, it is not unlike that animal in appearance, and has sharper and longer claws on its fore feet, which enable it to burrow and conceal itself under ground. The rabbit ranges for food during night, or early in the morning, and is remarkable for its fecundity, producing eight at a litter, and that so frequently as seven times a-year. The species is, however, beset with numerous enemies, of which man is the chief; and they are hunted both for the sake of their flesh and skins.

Genus 10. *Hyrax,* or Daman.

Char.—Two pointed cutting teeth in the upper jaw and four in the lower, projecting forward; four large grinders on each side of both jaws; tail wanting; four toes on fore feet, and three on the hind.

Spec. 1. *Capensis.* Cape Hyrax.—*Char.* Body thick, and greyish-brown, inclining to white beneath; fore feet with flat nails, hind ones with a sharp crooked claw.

This creature is a native of the Cape of Good Hope, and resembles the rabbit very much as to size and colour. It is very agile, skipping about in elevated places, among wild and rugged rocks, in the hollows of which it makes its retreat.

Similar to the Cape hyrax is the *Syrian askoko,* mentioned by Mr Bruce in his travels, and which he supposes to be the coney of Scripture.

ORDER V. PECORA.

Char.—Fore teeth six or eight in the lower jaw, remote from the grinders; none in the upper; four stomachs; upper lip more or less cleft; on each foot two toes and two hoofs; herbivorous and ruminating. Eight genera belong to this order.

Genus 1. *Camelus.* The Camel.

Char.—Without horns; six cutting and two canine teeth in the jaw below, and two cutting and several canine above; upper lip divided; neck long and arched.

Spec. 1. *Bactrianus.* Bactrian Camel.—Characterised by having two bunches on its back.

The height of this animal, to the top of the bunch, is six feet and a half. The head is short; ears small;

neck long and bending; tail tufted, and descending to the joints of the hind legs. It has a small hoof, and flat feet, divided above, the divisions not extending through the whole length of the foot, but each division or lobe being guarded at the extremity by smaller hoofs. It has six callosities, one on each knee, one in the middle of each fore-leg at the highest joint, one on the inside of the hind-leg at the lower part of the thigh, besides one on the lower part of the breast. The hair is peculiarly soft and fine, and of a dusky brown colour, with a ferruginous tinge. From accurate dissections of the camel, by Mr John Hunter, with the assistance of Mr Home, it does not appear to have five stomachs, as Buffon asserts, but only four. The second of these, however, is made up of various cells, the orifices of which are inclined upwards, and seemingly possessed of a degree of muscularity; therefore, supposing the water, by a power peculiar to the animal, to be directed into these cells till they be completely filled, and that the surplus only passes into the first stomach, then a quantity might thus be kept apart from the stomach, for the purpose of occasionally moistening the food, when required, in its passage to the fourth or true stomach. After drinking a large quantity at one time, and thus filling these receptacles of water, the camel is enabled to pursue his journey for several days without a fresh supply.

This most valuable quadruped inhabits most parts of Turkey, Arabia, Barbary, and Egypt; and in all those countries where it is found, its usefulness cannot be superseded by any other creature whatever. Like the elephant, it is tame, tractable, and possessed of great strength; like the horse, it travels securely with its master; and, like the cow, it furnishes him with milk for his drink, and meat for his table. The constitution and conformation which nature has bestowed upon this animal, peculiarly fit him for leading a laborious life, amidst the sultry deserts of his native land. He cannot boast of symmetry or beauty of form; but he is eminent for good qualities, and by no means fastidious with regard to his food, being fully satisfied when he finds abundance of wormwood, thistles, nettles, or furze; and, from the peculiar structure of his stomach, he can drink as much water at once as will be sufficient to quench his thirst for a number of days. This patient drudge, which Buffon calls the most ancient, the most complete, and the most laborious of slaves, is capable of carrying a load of ten or twelve hundred weight.

Considering all the valuable qualities of this useful animal, and the important services which are derived from his indefatigable labour, it must be admitted that he constitutes the genuine riches of the eastern world. Ever since the days of the patriarch Job, the people of Arabia have estimated their wealth by the number of their camels. To the inhabitants of the vast continent of Asia and Africa, they are of infinite value. Without them the people of that country could neither carry on trade nor subsist, as they are the only animals adapted by Providence for traversing these vast, and otherwise impassible deserts of burning sand, through which they transport the merchant in the most expeditious manner, and at the least possible expense.

This "son of the desert" constitutes an essential medium of conveyance throughout Arabia, Turkey, Persia, Egypt, and Barbary. In order to take on his burthen, he inclines his body in a proper posture; and, when loaded, he voluntarily rises, and yields to the guidance of his conductor, who buoys him on a fatiguing journey by the enlivening influence of music. It is usual for merchants or travellers, for the purpose of mutual safety, to associate together in a caravan, with a considerable number of camels, every precaution being requisite to evade the incursions of the predatory Arabs. Of the varieties of the camel, that called the turk-man is the largest and strongest, and the dromedary, maihary, and raguahi, are the most swift. But the race produced between the Bactrian camel and the dromedary is considered most valuable.

Spec. 2. *Dromedarius.* Arabian Camel, or Dromedary.—With one bunch on the back.

This species, which is neither so large nor so strong as that already described, is much more numerous and more generally diffused. It abounds in the upper regions of Africa, and in the warmer parts of Asia; but in Asia is seldom to be met with farther north than Persia, or in Africa farther south than Ethiopia. Being remarkably swift, the dromedary is trained for the saddle and for the race in Arabia, and, like the horse, is used for all the purposes of travelling, not only in the rapid conveyance of couriers, but also in drawing waggons and other vehicles. Without requiring whip or spur, it will, for nine or ten successive days, travel at the rate of 100 miles a day, over burning and barren sands. It is admirably patient, docile, and submissive; and, in allusion to its usefulness in conveying families or merchandise through the uninhabitable wilderness, is very expressively called by the Arabs the ship of the desert; and on account of the rapidity with which it performs its journies, it has been designated by the Chinese under the name of *Fong Key Fo*, or camel with feet of the wind. When overloaded, however, he absolutely refuses to proceed, and at the same time utters the most plaintive cries. The impatience of his rider also enrages him much; and so sensible is he of harsh or improper treatment, that he never fails to resent it, nor is he to be appeased but by the most conciliatory treatment. Indeed the Arab is well aware of the fatal danger incident to striking or provoking his beast, and, for the sake of self-preservation, he is generally guarded in his usage of it. Should he notwithstanding incur its displeasure, he has recourse to a simple, but effectual stratagem, to avoid the consequences; which consists merely in disposing his clothes in such a manner that the infuriated animal will mistake them for his master lying asleep, and will vent his wrath completely by violently shaking and trampling them under foot, after which the owner may safely approach, load, and guide him as usual. The Arabian camel is liable to periodical fits of rage, and, during the rutting season, he continues difficult of management for a period of forty days. It is likewise subject to a gradual moulting early in summer, and which is not unlike that of the horse. The coarsest fare satisfies the dromedary; it is capable of carrying as much as two mules; its flesh is used for food; its soft hair, like that of the larger camel, is valuable for painters brushes, as well as for the manufacture of shawls and carpets, and its skin is made into leather. As beasts of draught and burthen, this race of animals has been employed in Tuscany, and in some of the Canary islands, where they thrive extremely well; but the attempts to introduce them into the West India islands, have proved abortive. The camel goes with young one year, and produces one at a time, and the female at three years of age arrives at puberty. In about six years they acquire their full strength, and commonly live for 40 or 50 years.

Spec. 3. *Lama.* Llama.---*Char.* Bunch on the breast; and back smooth.

This species, denominated, by the older naturalists, *Ovis Peruviana*, is a native of Peru, and may be viewed as the camel of the New World, being peculiarly adapted for travelling over the elevated tracts of that quarter of the globe. It abounds in many other parts of South America, occupying the loftiest mountains, and ranging about with great agility. This valuable animal usually measures about six feet from the nose to the tail, and four and a-half feet to the top of the shoulder. Its back is somewhat elevated, neck very long, and head small. It neighs not unlike a horse; and being rather capricious, it squats down when enraged, and ejects its saliva to some distance, which is so acrimonious as to inflame the skin. Growing very rapidly, it continues vigorous from the third to the twelfth year, and its career of activity and usefulness terminates at the age of fifteen.

Spec. 4. *Paco.* Paco.---*Char.* Woolly and purplish brown, with the belly white; snout oblong.

This is less than the former species, and often found in a wild state in the elevated regions of Peru; and its wool is manufactured into cloth of a soft and silky texture.

Spec. 5. *Arcuranus.* Chilihuque.---*Char.* Body covered with very smooth wool; ears and tail pendulous; snout curved; neck and legs long.

The paco resembles a ram very much in appearance. It is either ash-coloured, brown, black, or white, and measures about six feet in length and four in height. The natives of Chili are said to have used it in ploughing and as a beast of burthen in former times, and likewise to have manufactured its wool into cloth.

Genus 2. *Moschus.* Musk.

Char.—Front teeth in the under jaw eight, and tusks solitary in the upper; no horns. There are seven species described.

Spec. 1. *Moschiferus.* Thibetian Musk.—*Char.* Upper lip projecting beyond the lower, and having a curved tusk about two inches long on each side; ears long and narrow; ferruginous.

This animal has some resemblance to a roebuck, and is upwards of three feet in length and two feet in height to the top of the shoulders. The female has two small teats, wants the tusks, and is less in size than the male. The musk species are very nimble creatures, chiefly inhabiting the most elevated regions of Thibet, where they are very numerous. It is extremely timid, and possesses a quick sense of hearing. The well known perfume, on account of which the species are hunted to their almost inaccessible retreats, is contained in an oval bag about the size of a hen's egg, and which hangs on the belly of the male only; and it is not uncommon for a dealer to purchase from 7 to 8 thousand bags of it in one journey, which proves that the animals from which it is procured are extremely numerous. This unctuous substance is of a brownish hue, and while newly extracted from the animal is said to be of so very powerful a nature as sometimes to force blood from the nose, eyes, or ears when rashly inhaled. After killing the animal, the hunters cut off the musk receptacle, which being merely tied up is ready for sale. The Thibetian musk does not appear to have been satisfactorily described till about the close of the seventeenth century, having been previously considered as a horned animal of the goat, deer, or antelope species. The ancients were unacquainted with this creature; and it appears that the physicians of Arabia first introduced the use of musk, which had become common in Europe, long before the quadruped itself was heard of in that quarter.

The *Javanicus* and the *Americanus* are two species of musk differing but little from that now described excepting in size. They are both of a rusty brown colour, but the latter has the throat white and muzzle black. The former is only about nine inches in length, and of a most elegant shape, with such slender legs that they scarcely exceed the size of a swan's quill.

Genus 3. *Cervus.* Deer.

Char.—Cutting teeth eight in the lower jaw, in the upper none; no canine teeth; a lachrymal vessel before and under each eye; antlers solid, annual, branched, and while young covered with hairy skin.

In their internal structure, the animals belonging to this genus somewhat resemble the bull, though in their external appearance they are widely different. The deer tribe is destitute of a gall-bladder.

Spec. 1. *Alces.* Elk, or Moose Deer.—*Char.* Throat carunculated; horns stemless and palmated.

The elk, being the largest of the deer kind, is stated by Mr Pennant to be at the utmost 17 hands in height, and of the enormous weight of 1230 lbs. The colour is greyish-brown; the hair, which is coarse and elastic, forms a sort of mane on the back and shoulders; the legs are long; neck thick and short; head large; horns stretching out to about 32 inches each, and sometimes weighing together 56 lbs; eyes and ears large; tail short, and hoofs broad. The female is without horns, and is not so large as the male. This animal has a quick sense of hearing, and an awkward but nimble trot. Inhabiting forests, it browses usually by night on the branches of trees. It abounds throughout Europe, Asia, and America. In Siberia it is generally found remarkably large; and in the vicinity of the lakes of Canada it is very common. The ancients believed that this animal was obliged to move backwards in feeding, to prevent his upper lip from being entangled between his teeth; but this is not the case, as he can raise it at pleasure. His motion is amazingly swift; his trot high and awkward; and in walking, he raises his fore feet very high from the ground. About the beginning of May the female produces sometimes three at a birth. The flesh, and more especially the tongue, of the elk is considered very delicious; its hair is employed in stuffing saddles, and its skin is made into shoe-leather, or used for covering tents. The hunting of the elk is therefore an important object with the Indians, who either overcome the animal by stratagem in the woods, or run it down in winter in the half frozen snow, when it sinks at every step, while they themselves are supported by means of their large snow-shoes. Some travellers describe this animal as considerably larger than an ox, and having the tips of its horns, when full grown, at the distance of nearly 12 feet from each other.

Spec. 2. *Tarandus.* Rein-Deer.—*Char.* Horns round, recurvate, branched, and having palmated extremities; body thick and square; legs not so long as those of the stag; colour most commonly grey, with the belly white, and the space about the eyes black; long hair on the under part of the neck.

The rein-deer is a most valuable animal, and, to the inhabitants of the northern regions of Europe, Asia, and America, is of the most essential service. When tamed it is active and yielding, though those of the wild breed are of a refractory disposition, so that they will sometimes turn upon the driver, and strike him so violently with their feet, that, to avoid the effects of their fury, he is obliged to take shelter under his sledge. The natives of Siberia, Lapland, and Greenland, yoke a pair of rein-deer to the sledge, and usually travel with them, while the snow is frozen, at the rate of fifty or sixty miles a-day. The Laplander, in particular, appreciates these animals so highly, that it constitutes the chief employment of his life to rear and to train them. In the number of them does his wealth consist; and it frequently happens, that an individual will possess from 500 to 1000 of them at a time. Two young ones are produced by the female at a birth, and they attain their full strength at the age of four years, after which they are trained, and then continue fit for labour for about five years more, and the period of their existence is commonly limited to 15 years. The rein-deer feeds principally on the lichen and other mossy shrubs, and is readily domesticated when taken young. This most useful quadruped forms a substitute for the horse, the cow, and the sheep, and is entirely confined to the cold regions, to which it is indigenous. The introduction of it into the warmer climates has been attempted, but without success. A few years ago, Mr Bulloch imported about forty of these animals from Lapland, which having been turned out to feed upon the high mossy ground between Edinburgh and Lanark, in Scotland, in the course of two or three months were reduced in number about one half, when the remainder of them were removed to England and Ireland. See LAPLAND.

Spec. 3. *Elaphus.* Red Deer, Hart, or Stag.—*Char.* Horns recurvate, branching, and cylindric; body of a reddish-brown colour.

This pacific and admirably elegant animal is commonly from 3 to 4½ feet in height, and seems entitled, by his grandeur, strength, and swiftness, to a decided pre-eminence over all the inhabitants of the forest. When well grown, the branches of its horns are about seven in number, and sometimes even more. These horns, which it sheds sooner or later in the month of March, attain their full growth about the end of June, at which time the skin becomes useless, and is rubbed off by friction against the boughs of trees. The stag inhabits many parts of Europe and Asia, as well as North America. Though more rare in Britain than formerly, it is still found in the wild state in the Highlands of Scotland, on the moors bordering on Devonshire and Cornwall in England, and on the heights of Kerry in Ireland. In different countries this animal varies considerably in size and colour; but among the largest that have been known in Britain was one killed in Aberdeenshire, the weight of which, exclusive of the head, skin, and entrails, was found to be 318 lbs. The stag feeds during summer on the buds of green shrubs, the flowers of broom or heather, or the leaves of bramble, but is particularly fond of rye. His food, however, necessarily varies according to the season. Though he dispenses with water in winter and spring, he searches for it in summer and autumn with the view of bathing and refreshing himself. His sight, hearing, and sense of smell are acute; he swims well; and in leaping, he finds no difficulty in clearing a pale or hedge of about six feet high. Of dogs he is more afraid than of man; but it is remarkable, that, should the leader of the herd rush on impending danger, the whole band instantly follow. The hind goes eight months with young, and generally produces one fawn about the month of May. Of her offspring she is so remarkable careful as often to preserve it at the risk of her own life. The flesh of the fawn is considered delicious; the horns, besides being useful for the handles of knives, afford the salt which constitutes the basis of the spirit of hartshorn, and the skin is made into excellent leather. If taken young, the stag is easily domesticated, and may be taught to perform different feats, or even trained to the purposes of husbandry. His natural term of existence does not exceed 40 years.

The *Cervus Wapeti*, or Gigantic Stag of the Missouri, is not unworthy of particular notice in this place. This very rare and beautiful animal has been only within these few years brought from the interior of North America, and exhibited in Britain by a German traveller.

While some have represented this as a nondescript species, others have considered it as no other than the elk, or moose-deer, an animal of an elegant figure, with palmated horns. Lord James Murray, it is said, purchased, at the expense of one thousand guineas, the first of these elegant quadrupeds, which had been brought to the United States in 1817, and thence forwarded to London; and that nobleman has happily succeeded in propagating the species at Datchet, near Windsor. Two of these animals, which had been domesticated by the Indians in Upper Missouri, were, in 1822, landed in Glasgow, by Mr Bulloch, where they were exhibited some days previous to their removal to London.

The wapeti is a ruminating animal, with a head somewhat like that of the *Cervus Virginianus*, or Virginian deer, but with digitated horns, and also in some degree similar to that of the horse,—like which noble quadruped, it is well adapted for the bridle and bit. His tongue is soft and smooth; legs remarkably strong and agile; and by means of a small oblique aperture, about an inch in length, beneath the inner angle of each eye, and in which is secreted a brownish substance, he emits at pleasure a remarkably loud whistling noise. His full size appears to be about sixteen hands. He is said to attain maturity at the age of twelve years, and to be exceedingly long-lived; but as one of the females bred in this country produced a young one when only a year and a-half old, the longevity of the wapeti is seemingly questionable. This animal is cleanly in his habits; he takes the same food as the horse; and being very docile, he is readily domesticated; and his mild disposition, his strength, and activity, render him peculiarly an object of regard. The female usually brings forth two at a time. The male only has horns, which measure almost five feet long, and weigh about 41 lbs., and are shed by him every year. His summer coat is thin, and colour reddish-grey, but in winter of a dunnish hue. In the Upper Missouri country, the Indian chiefs employ the wapeti in drawing their sledges during winter; and the species is likewise hunted with avidity for the sake of the venison, which is esteemed excellent.—Though naturally timid, the activity of these animals in the wild state, and when full grown, is such that they are almost never taken alive; but so strong is their family attachment, that when one of them is killed by the hunter, the rest, it is said, readily become his prey.

These animals are the largest, the most beautiful, and most valuable quadrupeds that have as yet been found in the American forest. In size, gentleness, and activity, they surpass the race horse; and their flesh is so nutritive and juicy, especially in the winter season, that they are hunted by the natives with the utmost avidity. By means of an unctuous substance, secreted by a gland on the outside of each hinder leg, this animal can dress his coat so effectually that it becomes impervious to rain or to water. Soon after their arrival in London, the wapeti were exhibited in harness; the proprietor drove them through the streets with surprising velocity, to the great astonishment of the beholders.

Spec. 3. *Dama.* Fallow-Deer.—*Char.* Horns slightly recurvate, compressed, and branching, also palmated at top; colour yellowish-brown, with the under parts whitish.

The fallow-deer which is neither so large in size nor so generally diffused as the stag, resembles that animal in its habits, but is less nice in choosing its food, and is later in casting its horns. The female is gravid eight months, and sometimes produces two or even three at a time. In almost every country in Europe, Britain excepted, the fallow-deer roam at large; but they are commonly retained in parks in England. At three years of age the fallow-deer is full grown, and the period of its existence extends to 20 years. It is less violent than the stag during the rutting season, and does not wander out of its own inclosures in search of the female.

Spec. 4. *Virginianus.* Virginian Deer.—*Char.* Horns bending forward, ramose, and somewhat palmated; brow without antlers.

This species is lighter in colour, and has a longer tail, than the fallow-deer, which it otherwise resembles. It is common in the provinces to the south of Canada, and in the savannas bordering on the river Mississippi, where it constitutes the main support of the Indians, the skin being a valuable object of traffic, while the flesh of the animal is used by them for food throughout the year, being capable of long preservation when cut into small pieces and dried over a gentle fire.

Spec. 5. *Capreolus.* Common Roe.—*Char.* Horns branched, round, trifurcated, upright, and bifid at top; body brown-tawny.

The length of this animal from nose to tail is generally three feet nine inches, and the height about two feet three inches. It is a native of many parts of Europe, and is to be found in Asia, and also in America, although it has not been clearly ascertained that it is a native of that continent. The roes do not associate in herds, but live in separate families. They frequent the thickest coppices, feeding on the catkins of the hazel and willow, as well as on brambles, broom, and heath. In spring, Buffon informs us, they repair to more open brush-wood, and eat the buds and young leaves of almost every tree. This warm food ferments in their stomach, and intoxicates them to such a degree that they are easily surprised. They know not whither they are going; and not unfrequently come out of the wood, and sometimes approach flocks of cattle and the habitations of men. Two fawns are produced by the female at a time, and remain with her for eight or nine months. When pursued by the hounds, the roe often effects his escape owing to his instinctive craftiness in manœuvring. His natural term of life is said to be 10 or 12 years. The race has been long extinct in England, but is still found in different parts of the Highlands of Scotland.

Spec. 6. *Axis.* Spotted Axis.—Horns slender, round and upright, with bifid or trifid summits; colour reddish-brown, with white spots.

Spec. 7. *Mexicanus.* Mexican Roe.—Horns three-forked, rough, and inclined forward; colour red.

Genus 4. *Giraffa.* Giraffe.

Char.—Front teeth eight in the lower jaw; outer teeth on each side bilobated; breast callous; protuberance in the centre of the forehead; hair smooth.

The camelopardalis is properly constituted a distinct genus. This handsome, timid, and mild-looking animal, the existence of which was formerly disputed, is remarkable for its height, being almost 17 feet from the fore feet to the top of the head. Owing to the shoulders being extremely high set, the fore legs have the appearance of being twice the length of the body. The neck is very long, finely variegated, and having a stiffish mane descending to the middle of the back; the head is small, and horns about half a foot in length; body in the fore part muscular and thick, but in the hind part meagre; tail cylindric and tapering, with a tuft of hair at the extremity; hoofs black; colour whitish, with brown spots. Inhabiting the forests of the interior of Africa, this peculiar animal browses on the branches of trees. When not grazing, it commonly appears with the neck and head erect, resembling a dog in a sitting posture. Its motion seems laborious and painful, as it moves the two legs on one side at the same time, instead of those on opposite sides like other quadrupeds. In lying down, it kneels like the camel; and in leaping, it first lifts the fore legs at once, as if fastened together, and then the hinder ones in the same manner. It appears to run fast, and when pursued is capable of trotting a great way at a time, so that a good horse has difficulty in overtaking it; and against its pursuers, when overtaken, it defends itself powerfully by kicking. The Hottentots, however, hunt this animal for its flesh, and the marrow in particular, which they consider delicious, and of the skin they make vessels for holding water. It appears that the ancient Romans were acquainted with the giraffe, which, by Julius Cæsar, was exhibited in the Circæan Games.

Genus 5. *Antilope.* Antelope.

Char.—Eight cutting teeth in the lower jaw, canine none; horns permanent, hollow, generally ringed at the base, upright, and assuming various inflexions.

Most of the species of this numerous genus being but recently known, not more than six of them have been described by Linnæus; and these were disposed of under the genus Capra, as this animal appears to be the link that connects the goat and the deer kind together. The antelope species are generally very elegant, swift, timid, and restless. Indeed the fleetness of these animals has been proverbial since the earliest times, and allusion is made to this circumstance in several passages of the sacred writings. The speed of Asahel, (2 Sam. ii. 18.) is elegantly compared to that of the Tzebi, and the fleetness of the Gadites to the antelopes upon the mountains. The greater part of the species inhabit hilly countries; but some are likewise found in the plains. In hunting them, the falcon, which is trained for the purpose, is employed to assist the dogs in coursing, and impedes their flight by fixing himself between their horns, and beating their eyes with his wings. In India and Persia a species of the leopard tribe, which seizes his prey, not by swiftness of foot, but by the greatness of his springs, and by motions similar to those of the antelope, is trained to pursue it; but should the former miss his aim at the first bound, the game escapes. The whole species, except two, inhabit the hot regions of the world, especially in Africa and Asia. In Europe only the chamois and saiga are found. None have as yet been discovered in America. While some of the species associate in small companies of about half a dozen, others, it is said, go in herds of about 2000. They browze like the goat, or eat the tender shoots of trees; and their flesh, except in the musky species, has consequently a pleasant flavour.

Sect. I. *With Horns nearly straight.*

Spec. 1. *Oryx.* Egyptian Antelope.—*Char.* Body grey; face black and white; dorsal stripe, dusky.

The Egyptian antelope, or pasan, is distinctly characterized by its horns, which measure almost three feet in length, are nearly straight, somewhat slender, and annulated towards the base, but towards the point smooth and tapering. It rather exceeds the deer in size; and its height, to the top of the shoulder, is about four feet. It has a black line extending from the neck to the loins, covered with hairs longer than the rest, and the inferior part of its body is whitish. Being a native of Africa, it is common about the Cape of Good Hope, and is distinguished by the name of the chamois.

Spec. 2. *Gazella.* Gazel.—*Char.* Horns wrinkled, slightly bowed, and tapering; body bright bay, with the breast white.

This species is of the size of a fallow-deer, easily tamed, and similar in its habits to many others of the same tribe. Its horns are about three feet in length, black, and slightly annulated. Resident in Persia, India, and different parts of Africa, its eyes are deemed so beautiful, that, in the east, ladies are often complimented by comparing their eyes to those of the gazella.

Spec. 3. *Grimmia.* Guinea Antelope.—*Char.* Horns short, black, slightly annulated, and sharp pointed; forehead with black bristly tuft of about two inches and a half in height; colour yellowish-bay, with the throat, abdomen, and inside of the thighs cinereous: the sinus lachrymalus very distinct; tail short; limbs slender.

This handsome and sprightly animal is a good deal less in size than the roebuck. It is chiefly resident between Guinea and the Cape in Africa, and it inhabits places overgrown with brushwood.

Spec. 4. *Oreotragus.* Klipp-springer.—Horns very erect, tapering, and slightly wrinkled at the base; body of a tawny-yellowish, with the belly white.

Sect. II. *With Horns curved, bent, or twisted.*

Spec. 5. *Picta.* Nylghau.—*Char.* Body slate-coloured, with a white spot beneath the throat, and the feet striped with white and black; top of the neck maned with black hair, and a tuft of the same on the breast; ears large, edged with white, and having two black stripes within; tail tufted.

These beautiful animals, which, with Aurengzebe, were a particular object of the chase, inhabit the remote interior parts of India. Several of them having been brought to England in 1767, one was kept by Dr W. Hunter for some time, who first described the species. The nylghau was found by him to be very gentle and timid, and to have a very acute sense of smelling. When an attempt was made upon it, the animal fell upon its fore-knees,—a position seemingly more of humility than of defence, especially as no disposition to hostility was apparent. According to the account of Lord Clive, however, the nylghau prepares for the attack by thus falling down, after which it makes a spring or dart. Two males acted in this manner when put into an inclosure. The height of this animal is generally four feet to the top of the shoulder, and the length from the bottom of the neck to the base of the tail the same. The female being extremely different in appearance from the male, might be taken for a different species. She has no horns; is of a yellow colour, and small size, and produces one or rarely two young at a time, which are not unlike a fawn. One of these animals was exhibited in Edinburgh a few years ago. As this remarkable species are capable of breeding in this country, they may in all probability rank among our grazing quadrupeds at some future period.

Spec. 6. *Bubalis.* Cervine Antelope.—*Char.* Head large, and lengthened; horns thick, strong, and wrinkled; colour reddish-brown; tail longish.

This animal, which is by some taken for the *bubalis* of the ancients, participates of the form of the heifer and stag, and is resident in the northern parts of Africa. Its height, to the top of the shoulders, is nearly four feet, and its horns, seated pretty close together, measure at the base eleven inches round, while their length is about twenty inches.

Spec. 7. *Cervicapra.* Common Antelope.—*Char.* Horns round, annulated; body tawny; brown above, dirty white below.

The common antelope is generally not so large as the fallow-deer, and its elegant horns, the tips of which are at the distance of sixteen inches from each other, measure in length fourteen inches. It inhabits many parts of India and Africa, and is common in Barbary.

Spec. 8. *Saiga.* Scythian Antelope.---*Char.* Yellowish-grey, with horns distant, semi-transparent, and lyrated.

This species is capable, for a short time, of outstripping the swiftest horse. In running it seems to yield to one side, and its feet seem scarcely to touch the ground; but it is so timorous, that the bite of a dog perfectly unqualifies it to move from the spot where it falls. The female goes with young during winter, and in the month of May produces one at a birth. Inhabiting the northern deserts, from the Danube and Dnieper to the Irtish, and feeding on the salt, acrid, and aromatic plants of those regions, the saiga is more especially found in Poland and towards mount Caucasus and the Caspian sea. It likewise abounds in the sterile and dreary wilds of Siberia. Before lying down together, the saigas observe the precaution of causing some of their number to watch as sentinels, in order to avoid the hunters or other enemies. Such is their quickness of scent and observation, that the hunters, in pursuing them, must approach against the wind, and must not have on clothes of any attractive colours. These animals are shot, or caught with dogs, and sometimes by means of a species of eagle trained for the purpose. Their flesh, horns, and skins, amply reward the toil of the hunters.

Spec. 9. *Springer*, or White-faced Antelope.—Ferruginous brown above, white beneath, with a dark lateral stripe and white rump.

SECT. III. *With Horns hooked.*

Spec. 10. *Gnu.* Gnu. Ox-headed Antelope, or Gnu.—Horns bending forward and suddenly backward; body ferruginous brown; neck maned; tail whitish.

In this extraordinary species are united the head and horns of the bull, the elegance of the stag, and the striking beauties of the horse; and they are, moreover, characterised by having a strong beard, together with very long hairs hanging from the breast. They associate in herds in the country of the Nimiquas, where they are hunted for the sake of their flesh, which is used for food.

Spec. 11. *Rupicapra.* Chamois.—*Char.* Horns smooth and erect, with the extremities hooked backward; body brown; ears situated near the horns.

The chamois, which is of the size of a common goat, is chiefly distinguished from it by the horns, which are about six inches in length, and without any longitudinal ridge. This, together with the saiga, is the only species belonging to the antelope tribe which is found in Europe. These sociable animals are generally seen in rocky and elevated situations. They go in flocks on the mountains of Dauphiny, Piedmont, Germany, Savoy, and Switzerland; and it is astonishing with what facility and apparent indifference they skip from rock to rock, and climb or descend the most frightful precipices. Such, indeed, is the agility of this species, that dogs are absolutely useless in the pursuit of them, and they can be followed by no quadruped whatever. Early in the morning and evening they go to pasture; and during the heat of the day, which is quite intolerable to them, they have recourse to the shade of overhanging precipices, or the thick and spreading forests on the declivities of the mountains. While they eat together, one of their number is employed to act as sentinel, and he announces the approach of danger by a loud and sharp hissing noise. Together with their other qualities, they possess remarkable acuteness both of vision and scent.

Except in cases of danger, the cry of these animals is merely a feeble bleat. They feed on the most delicate parts of plants and flowers, and drink but little while feeding on succulent herbage. In winter they inhabit the thickest forests, subsisting upon the shrubs and buds of the pine tree. Though naturally wild, they are susceptible of being tamed, and by means of gentle treatment they become very familiar. Their natural term of life is from twenty to thirty years. The flesh of the chamois is very agreeable, and the skin, when tanned, is peculiarly soft, and called *shammoy*, or *shammy* leather.

No small intrepidity is necessary in the arduous business of hunting the chamois, as, when hard pressed, it has been known to turn upon the pursuer and effect his destruction. In hunting it, different individuals are sometimes stationed at all the passages of a glade or valley, whose duty is to rouse the game, which is generally shot from behind the rocks. So extremely hazardous, indeed, is the occupation of the hunter, that, it is said, few grow old in it. "I was acquainted," says Saussure, "with a young man of the parish of Sixt, well made, of a prepossessing countenance, and who had just married a beautiful woman. In the course of his conversation with me on this subject, he thus expressed himself: 'My grandfather died in the chase, my father also died in it, and so fully persuaded am I that I too am destined to a similar fate, that I call this hunting-bag which you see, sir, my winding-sheet, because I am certain I shall have no other; and yet, if you would make my fortune, on condition of my renouncing the hunting of the chamois, I could not consent to it.' I have made some excursions on the Alps with this man, and had occasion to remark his astonishing dexterity and address; but his temerity surpassed his strength: and I was informed that, two years afterwards, his foot slipped on the edge of a precipice, and he experienced the lot which he had predicted."

Genus. 6. *Capra.* Goat.

Char. Cutting teeth below eight, canine none; horns in both sexes, nearly close at the base, rough, and inclined upwards and backwards; hair long; beard under the chin in the male; tail short.

Spec. 1. *Hircus.* Common Goat.—*Char.* Bowed keeled horns, having generally an outward curvature towards the points. There are eight species.

In the domestic state, this hardy species abounds in most parts of the world, and varies a good deal in size and colour. It is remarkably playful; but though more strong and swift than the sheep, is inferior in point of utility, except to the inhabitants of the more mountainous parts of Europe, whom it supplies with many necessaries and comforts of life. In Wales, particularly, the flesh of the goat, being properly cured, is an essential article of food during the winter season, and is considered a good substitute for bacon. The flesh of the kid is likewise much esteemed; and its skin, as well as that of the goat, is extremely valuable in the manufacture of gloves. In some quarters of the world, the skin of the goat is made into stockings, bed-ticks, bolsters, and bed-hangings.

The goat seems peculiarly adapted for roaming at large, and is capable of enduring the extremes of cold and heat, prefers the uncultivated heath or shrubby rock, and climbs securely the most rugged cliffs and lofty precipices. The milk of this valuable animal is understood to have a very nutritive and exhilarating effect on weakly constitutions; and to different places in Scotland, Ireland, and the north of England, valetudinarians annually resort, in the summer and harvest, with the view of procuring this medicinal beverage. The domestic goat is commonly brown, black, white, or spotted. In warm climates, it is said the female produces four or five at a birth; while, in more temperate regions, it brings forth two, or sometimes three. The goat is remarkably full of ardour, but soon decays, being but a short-lived animal. It will breed with the sheep; and their offspring breeds again, though without any new results from the intermixture. Previous to the discovery of America, it appears not to have been known in that vast continent; and, according to the hypothesis of some, it was at first introduced from the east into our island.

Among the most remarkable varieties of the goat species, are, the *C. depressa*, or African goat, which is rather dwarfish. The *C. angorensis*, Angora goat, with short legs, black, spreading, and finely twisted horns. The hair of this species, from which the finest and softest camlets are manufactured, is of a milk-white colour, and flows in spiral glossy ringlets. The *C. mambrica*, or Syrian goat, with very long pendulous ears; and the *C. reversa*, or Whidaw goat, a dwarfish kind, the flesh of which is much esteemed in Africa.

Spec. 2. *Ibex.* Ibex, or Wild Goat.—*Char.* Throat bearded; horns long, knotted, and bent over the back; body greyish above, and white beneath.

The ibex is strong, nimble, and of greater size than the common goat, which, according to the supposition of Buffon, has been derived from it. This animal is found in different mountainous regions of Europe and Asia; and being remarkably wild and daring, sometimes turns upon the huntsman, and tumbles him from the rocks; and, when hard pressed, will throw itself from the most elevated cliffs, alighting on its horns, and thus effecting its escape unhurt. In descending these precipices, it takes enormous leaps, with the utmost facility, from one slight projection of the rock to another, in order, as it would seem, to break its fall. As it is extremely shy, and always takes its station on the pinnacle of the highest rocks, the hunting of this animal is a laborious and very dangerous occupation.

Some of the horns of the ibex have been found of the length of two yards; and they are said to acquire new knots every year the animal lives. The habits of this species are similar to those of the common goat; and the female brings forth one, and sometimes, but rarely, two at a time. During night, small herds of these animals feed together in the elevated woods. Their usual cry is a short sharp whistle, similar to that of the chamois.

Genus 7. *Ovis.* Sheep.

Char. Horns hollowed, twisting inwards in a spiral form, wrinkled, and directed backwards.

Though sheep are inferior, in point of hardiness and agility, to the animals of the preceding genus, they are by no means what Buffon describes, "destitute of every art of self-preservation." In their domestic state they are, no doubt, the most timid and defenceless of all quadrupeds; yet view them in their native wilds, on extensive mountains, where considerable flocks range at liberty with comparatively little dependence on the shepherd, and their character appears to be the reverse of timidity. In the event of an attack from an enemy, they promptly form themselves into a compact body, the males being in front, and the ewes and weakly sheep in the middle, and thus put every foe at defiance. Nay, a ram, in such situations, will not hesitate to attack a dog, or even a bull, and fight with such determined vigour as to come off with success. The mouflon, which is the sheep in its natural or wild state, is bold and fleet, inured to flight by frequent pursuits, and initiated in the arts of defence by continual combat.

Few quadrupeds evince more instinctive discrimination in the choice of their food than sheep; and their foresight respecting the approach of a storm is not a little remarkable, as well as their prudence in uniformly selecting the most eligible place of shelter. They are peculiarly qualified, by means of their fleecy covering, to withstand extreme cold; and whole flocks of them have been frequently buried for days beneath the snow, without sustaining any material injury. Sheep, if possible, avoid marshy soils, preferring dry, open plains, and grassy or heathy hills, where they delight in cropping the sweetest grasses.

Their term of life seldom exceeds fourteen or fifteen years. The female goes five months with young, and commonly produces one or two at a time, and sometimes even three or four, and, when housed, she brings forth at any season. In Spain, the merino generally produces one lamb every six months, and will do the same in Britain if housed and richly fed.

The sheep is a hardy animal, and will thrive almost on any pasture; but its qualities change materially according to the nature of the soil on which it is fed. Rich pastures generally breed tall straight sheep; barren hills and downs produce them short and more square; woods and mountains render them slender and tall; but new-ploughed lands and dry grounds produce the best; and, on the contrary, those that are wet and liable to be overflowed are hurtful, except salt marshes, which are esteemed extremely wholesome. The disease to which this animal is most subject in Britain is the rot, to prevent which agriculturists now generally sow a small quantity of parsley seed along with their other artificial grasses. Captain Napier, R. N. has recently produced a highly interesting work on the treatment of sheep considered as a farm-stock.

Aries. Common or Domestic Sheep.—*Char.* Horns compressed, and of a crescent form.

This species is found in perfection in different parts of Asia as well as in Europe, but does not seem constitutionally adapted to live in the wild state, nor to bear the extremes of cold and heat. But, in its domestic state, the sheep is peculiarly the creature of man, depending on his care and protection, and, in return, contributing in an essential degree to his comfort and happiness. Every part of the animal is suited to some economical purpose; the flesh constituting nourishing food, the milk being formed into cheese, the fleece indispensable for clothing, and the skin and entrails applied to different useful purposes. For the principal varieties of the domestic sheep in Britain, see *Live Stock* under AGRICULTURE.

Besides the different breeds of domestic sheep in Britain, there are many other varieties; and seldom, indeed, in any two countries are to be found those of the same kind. They vary in size and weight, in the flavour of the flesh, the quantity of fat, the fineness of the wool, and in many other particulars. France, Italy, and Spain have each their valuable varieties, although all of them are inferior in size to those of England. The woolly sheep is found only in Europe and the more temperate climates, as it loses its soft fleecy covering when transported into warmer regions. Among other varieties, the following may be considered as the most remarkable.

The many-horned Sheep is found in the northern parts of Europe, chiefly in Iceland and Muscovy, but frequently in the Hebrides and Ireland. It resembles the English breed in its shape, but in its horns it is somewhat different, having generally four, and sometimes more, proceeding from various parts of its head. In its appearance it its very formidable, and seems destined for a state of hostility, although, like the other domestic kinds, it is mild and timid. Under its external coat it has an internal covering of a finer and softer nature, resembling fur.

The African, or Guinea Sheep, is distinguished by its emaciated appearance, long neck, and pendulous ears, and having under its chin a kind of dewlap. It is large, and more swift than the common breed; has a long mane which reaches below the neck; has short horns; and, being a native of the tropical climates of Asia and Africa, its wool is coarse and hairy.

The Broad-tailed Sheep, principally remarkable for the size of its tail, which is of an immense weight, from 16 to 50 pounds, and is often supported upon a small board with wheels, to facilitate the animal's movements; from whence arose the fiction of their having carts to carry their tails. Their tails are said to constitute the most marrowy and luxurious food. This sheep is common in Arabia, Persia, and Egypt, and the fineness of its wool depends upon the temperature of the climate where it is found. The wool of this sheep bred upon the mountains of Thibet is of great length, and extremely fine; so that the India shawls, which sell in Britain for between thirty and fifty pounds, were erroneously supposed to be made of the wool of it, but which are manufactured from a down growing among the long hair of a species of goat resembling the common Welsh goat.

The fat-rumped tailless Sheep, is remarkable for having two large cushions, or half globes of suet, on the hinder extremities, and no tail. It is a native of Tartary; has long coarse wool, and is generally white, except the head and ears, which are black.

The Cretan, or Wallachian Sheep, which is a native of Crete and the other islands of the Archipelago, is remarkable for straight spiral horns, surrounded with a winding furrow, and twisted in the shape of a screw.

Besides these may be mentioned the *mouflon,* or *musimon,* as occupying a middle place beween the sheep and the goat species. Although properly neither sheep nor goat, it has been ranked with both; and some naturalists have considered it as the origin of the ovine tribe, while others regard it as a distinct species. It has also been called the Ammon, or Siberian sheep, or the Argale. It is found along that immense chain of mountains which stretches through the middle of Asia to the Eastern ocean, and is also to be met with in Barbary, Sardinia, Greece, and Kamtschatka. In summer, they range the highest elevations, but in winter move downwards into the plains.

Genus 8. *Bos.* Ox.

Char.—Fore-teeth in the lower jaw eight, canine none; skin of the neck loose and hanging; horns short, concave, smooth, and conical, and inclined laterally; tail long, and bushy at the end.

The varieties of this tribe of animals are very widely diffused, and very numerous; and, when domesticated, appear even more valuable to man than the sheep. They abound chiefly in flat pastures; and though generally very fierce in their native plains, most of them are capable of being domesticated. Their cry is called *lowing* or *bellowing*. When irritated, so strong and powerful are they, that few animals are fit to combat with them singly. In fighting, they kick with their feet, and push violently with their horns. The varieties are many, but not more than six species are described.

Spec. 1. *Taurus*. Common Ox.—*Char.* Horns round, and curved outward; loose dew-lap.

Under various modifications, this species of domestic animals are diffused over most parts of the world, being propagated in almost every climate. Both on the north and south of the American continent, they have multiplied amazingly. Oxen are observed to prefer sheltered meadows which afford rich and succulent grass; they drink in the manner of the horse, sleep but little, and lie on the left side. They continue robust and vigorous usually from five to nine years, but rarely survive the age of fifteen. In their tenth month, the first front teeth are superseded by others which are broader, but less white; in the sixteenth month those next to the middle of the row are likewise replaced by others, and the whole cutting teeth are thus renewed by the third year. About the fourth year a ring appears at the root of each horn, and this being followed every year by a succeeding one, an index is thus afforded for discovering the animal's age. The cow goes nine months with young, produces generally one at a time, and will yield her milk freely in the absence of the calf. Though unwieldy and dull in their general aspect, oxen are observed to possess not a little sagacity and susceptibility of attachment; and they are remarkable for pliability and constancy of disposition. A description of different breeds of cattle, together with the manner of feeding and fattening them, as well as directions concerning the dairy, will be found under AGRICULTURE.

The *Bison*, which is chiefly remarkable for a large bump between the shoulders and a long shaggy mane, flowing down beneath the chin, is supposed to be the origin whence all the known varieties of the ox kind have sprung. This large and savage-looking animal is of a great size, his horns are strong, short, and distant; forehead large and eyes fierce; and he is met with in most of the southern parts of the world, varying in size according to climate and soil. In America the bison attains a great size, and was, on the discovery of that continent, the only animal found resembling the cattle of Europe.

Under this species are likewise described the *zebu*, which is known by having a small bunch on the shoulders, and which, as well as the former, is gentle when tamed. The Indian ox is characterized by having a large double or treble protuberance above the shoulders; the Titian ox is white with black ears; and the loose-horned ox has the horns attached merely to the skin. There are also many other varieties.

It is amusing to consider the various uses to which all the parts of the ox are adapted. The hair of the animal is employed in different manufactures, and the sinews are sometimes formed into strong threads for the use of saddlers. Of the tallow, candles are made; and of the horns are fabricated combs, boxes, cups, and knife-handles. From the parings of the hides, &c. boiled and dissolved in water, glue is manufactured; and the bones, in many respects, supply the place of ivory; and, from the thinnest of the calf skins are made the most beautiful vellum. Of the skin of calves taken out of slaughtered cows, transparent snuff-boxes have also been fabricated.

Spec. 2. *Bubalus*. Buffalo.—*Char.* Head larger than that of the ox, and forehead more elevated; muzzle long, broad, and square; horns directed backwards and inwards; colour blackish.

This animal is more wild and stern than the bull, and very much resembles the common ox in appearance. In the domestic state he is submissive to the yoke; and, from his superior strength, becomes very serviceable to man. According to Sparrman, the length of the buffalo from head to tail is eight feet, the height five and a half; the ears a foot long, and rather pendulous. In many parts of India and Africa, buffaloes are found in the wild state. Being domesticated, they are employed to advantage in Italy for agricultural purposes, and rendered valuable both for the draught and the dairy. Such is the utility of these animals in drawing heavy loads, that two of them yoked together to a cart will bear along as much as four horses. They are guided by means of a ring, passed through the nose. In Abyssinia this species grows to double the size of our largest oxen, and has the skin naked and black, on which account they are named *elephant bulls*. They swim over the broadest rivers, and in the course of their progress frequently dive to a considerable depth, and with their horns raise up plants which they use as food. In Persia, the island of Sumatra, and other eastern countries, buffaloes are reared with considerable care, and in great numbers, for the purposes of labour. They are, however, remarkably dirty in their habits, being, like the hog, fond of wallowing in the mire, and their voice is loud and uncouth. The female goes with young twelve months, and produces one at a time. Her milk is considered inferior to that of the cow, but is yielded in greater abundance. The flesh of the buffalo is said to be rather coarse and unpalatable, though in some countries it is considered as very little inferior in quality to beef. In America the flesh of the calf is very much relished. Durable leather is formed of the hides of the buffalo, and the horns are held in great request by cutlers and other manufacturers.

In the wild state, the buffalo tribe are extremely formidable, cunning, and ferocious, and the only means of escaping from their fury is to climb a very large tree. They are said to dart from behind a thicket upon the defenceless traveller, whom, having once thrown, they trample to death, and lick with their rough tongue, till the skin is almost stripped from the flesh. Their hides are so very thick as to be impervious, at a moderate distance, to a common musket ball; and therefore the hunters, who shoot them from the tops of trees, make use of balls partly formed of tin.

One of the first settlers in North America, as stated by Mr Ashe, in his travels in that country, having built a log-house on the borders of a salt spring, the buffaloes, for several seasons, paid him a visit annually, following each other in single files, at equal distances, and forming droves of about 300 each. At first they rubbed his house completely down, so that he was glad to make his escape from the ruins. He supposed that at, one time, there could not be less than 10,000 assembled in the vicinity of this spring, where they bathed and drank several times a day, for about a week, and afterwards separated into distinct droves, travelling in regular files as on their arrival. To preserve the moisture upon their skin, and to resist the stings of the millions of insects that infested them, they rolled themselves in the mud, and thus formed to themselves a complete defence.

During the first and second years, this man and his companions killed about 700 of these fine animals, whose skins they disposed of for two shillings each; after which they returned from this scene of slaughter, till the carcasses were devoured by wolves, panthers, eagles, and other ravenous creatures. At the commencement of the two next seasons, they killed a great number more out of the first droves that came up. These they skinned, and exposed their carcasses to the sun and air; but as soon as the other droves came near, they paused, and gazed on the putrified and mangled bodies, moaned aloud, and returned furiously into their native wilds, without tasting the impregnated spring, nor did they or any of their companions ever return,

Spec. 3. *Moschatus.* Musk Ox.—*Char.* Horns of the male approximated at the base, bending inwards and downwards, and outward at the tips; hair very long and pendant.

This species is a native of North America, where, being extremely nimble, it frequents rocks and mountainous places. It is longer and thicker than the deer, but not of equal height, the legs being remarkably short. The horns of the male, which are two feet in girth towards the base, and only two feet long, weigh together, from 50 to 60 pounds. This animal has the shoulders raised into a lump, and, from the long fine hair of a dusky colour, and the fine wool with which he is covered, presents a most shapeless aspect. The flesh of this animal is very good, though it partakes in no small degree of the flavour of musk; the skins have a peculiar warmth, and the wool is manufactured into stockings, which, in their appearance, are finer than silk. The Esquimaux Indians make caps of the hair.

Spec. 4. *Grunniens.* Yak.—*Char.* Horns cylindrical, and curved outwards; hair long, shaggy, and pendant; tail thick.

This animal, which not a little resembles an English bull, has the forehead apparently prominent from a mass of curling hair with which it is ornamented, and the rump low, and is in Hindostan called *soora goy.* On its shoulder is a protuberance very thickly covered with long soft hair. It makes a feeble grunting noise, and never lows loud as the European cattle frequently do. Being strong and sure-footed, these animals are extremely useful as beasts of burden, but are seldom or never employed in agriculture. Their tails, consisting of a prodigious quantity of long beautiful glossy hair, are in great estimation in Hindostan, where they are used for driving off musketoes and other winged insects, as well as for ornamenting the trappings of elephants and horses. This species is common on the high plains and bleak mountains of Thibet, and affords a rich supply of milk. The excellent butter that is produced from it is preserved in skins or bladders, and retains its flavour in this cold region throughout the year.

ORDER VI. BELLUÆ.

Char.—Front teeth in both jaws obtuse; feet with hoofs either entire or subdivided; herbivorous. The genera are four in number, the horse, hippopotamus, tapir, and hog.

Genus 1. *Equus.* Horse.

Char.—Six front teeth in both jaws; those of the upper parallel, and those of the lower projecting; a canine tooth on each side in both jaws; hoofs entire. Six species are enumerated.

Caballus. The horse.—Tail covered uniformly with long thick hair.

That noble animal, the horse, which, when domesticated, is peculiarly remarkable for his spirit, docility, and usefulness, is to be found in almost all parts of the habitable globe; but it is chiefly in the plains of Arabia and Africa, and some parts of South America, that he is beheld in the possession of entire freedom. Hundreds of them range together in those widely extended tracts, while one of their number is uniformly appointed to act as sentinel, and give the alarm in case of approaching danger, which he does by uttering a snorting kind of noise that is instantaneously attended to by the whole herd, who immediate set off with the utmost velocity. The wildest horses in the world are those of Arabia, which are usually brown, and have the mane and tail of black tufted hair. They are smaller than the tame ones, and are commonly taken by means of snares or pits. When caught, they are treated with the utmost fondness, and the greatest care is taken to avoid crossing the breed. This superior race has been diffused over Persia, Egypt, and Barbary. The wild horses of America are rather small, have long ears and necks, are easily tamed, and are originally of the Spanish breed.

Though considerable numbers of this tribe are found in a state of native liberty in different parts of the world, it seems more than probable that these have sprung from domestic generations, and that the horse has never maintained an absolute freedom in any quarter of the globe. It is, moreover, probable that Arabia is the primitive country of this admirable race. There they are treated with the same anxious care as the children of the family; they live with their master under the same tent, and hence they have become exceedingly docile and familiar. For farther information respecting the horse, see AGRICULTURE, MANEGE, and MEDICINE VETERINARY.

Hemionus. Jickta.—*Char.* Head large, with the front flattened; eyes with ash-coloured irides; teeth in the mouth thirty-four; slender neck, with a soft erect mane; body long; hoofs similar to those of the ass, and tail like that of a cow; colour yellowish-brown, and darker in winter than in summer. The length of this species is fully five feet, and the stature like that of an ordinary mule. The jicktas avoid forests and elevated tracts, but range the open plains in companies of twenty, thirty, and even more. They are remarkably swift and vigilant, and though naturally timid, are, when pursued, bold in their own defence. In the southern parts of Siberia they are hunted for the sake of their flesh and skin, and in chasing them the hunters always endeavour first to kill the one acting as sentinel, who is generally discovered by his being seen guarding at a distance from the herd. This species, supposed to be the *hemionus* of Aristotle, has been forgotten in a great measure since the time of Pliny.

Asinus. Ass.—*Char.* Tail tipped with long hair; blackish cross over the shoulders.

This species is so generally known, as not to require minute description. In the mountainous regions of Tartary, and the southern parts of Persia and India, as well as in South America, the ass has a beautiful and lively appearance, standing higher on its limbs than the domestic breed, and being covered with soft silky hair. In his wild state, the colour is generally of a silver grey; the upper part of the face, sides of the neck and body, and hind part of the thighs of a flaxen hue, and the fore parts are divided from the flank by a white line extending round the rump to the tail, and down the back and across the shoulders run two stripes of bushy hair of a dark colour, like the cross in the common ass. In his habits this animal is not unlike the wild horse, and, though naturally timid, he defends himself against his pursuers in an able manner, by means of his heels and mouth. He has a quick ear and an acute sense of smelling; the spontaneous plants of the desert serve him for food; for his drink, brackish water is more relished by him than fresh, and he will taste of none but that of the clearest brooks, and never dips his nose in it like the horse. It is only when doomed to servitude and oppression that the ass assumes that stupid stubborn aspect, which has subjected the species to contempt in the different countries of Europe; and consequently the neglect and abuse which they have been long compelled to endure, in the domesticated state, is much to be regretted. The breed of asses is much and well cultivated in Spain, where some of them are valued as high as the best horses are in Britain. In his natural state, he is fierce and swift of foot; but after carrying the first load, his celerity ceases, his ferocity is no more, and he contracts that dull aspect peculiar to the tame species, becomes the most patient and gentle of all domestic creatures, and suffers with courage and constancy the most cruel treatment.

The ass species have been multiplied to a great degree in America; the Spanish breed has been brought to great perfection; and those of Egypt and Arabia are extremely graceful in their attitudes and movements, possessing great swiftness and sureness of foot, while at the same time they are very hardy. Though of a sluggish appearance, the ass is strong and more hardy in proportion to his size than the horse; and his abstemiousness renders him a desirable object to the indigent peasant. He never lies down to sleep but when fatigued, and even then he requires comparatively little time to rest. The female goes about eleven months with young, and produces one or sometimes two at a birth. When young the ass is very playful, though by no means of a lively appearance. This animal attains maturity at four, and lives from twenty to thirty years. He becomes much attached to his keeper, and familiar with places to which he is accustomed; he always endeavours to preserve dry feet; is very sensible of abuse; and, when overloaded, lowers his head, and bends his ears downwards.

The milk of the ass being light and nourishing, is employed as a specific in cases of pulmonary disorders, and on the continent it is used as a cosmetic. Though the flesh of the domestic variety is dry and tough, that of the wild ass is considered not inferior to the flesh of the boar, and is much esteemed by the Tartars. From its hardness and elasticity, the skin of this animal is applied to different purposes of manufacture, especially for memorandum-books; and that part of it near the rump is in eastern countries made into *sagri*, otherwise called *shagreen*.

Mule.—The mule, which is generally proverbial for obstinacy, is, when properly bred, a most vigorous animal, being less liable to disease, and also longer lived, than the horse and ass. People of rank in Spain afford so liberal a price as 50 or 60 guineas for this animal, which they employ to draw their carriages. In Brazil, they are so extremely useful and so numerous, that in some years, according to Mr Henderson, no less than 30,000 of them pass through the province of St Paulo. So sure-footed is the mule, and so sagacious a judge of his own path, that it has been recommended in journeying with this animal to leave him a good deal to his own guidance. His dexterity and address in travelling over the Alps and Andes, is highly spoken of by travellers. When they arrive at the summit of a declivity, they prepare for the descent by placing their fore feet together, and bringing their hind feet forward, as if they were intending to lie down; and in this attitude they slide to the bottom with amazing swiftness, following exactly the windings of the road, till with their rider they reach the bottom in safety.

The *hinny*, being the produce of the horse and female ass, is less cultivated than the preceding, because it is inferior in appearance as well as strength, and consequently much less adapted for travelling or drawing burthens. The mule and hinny seldom propagate together; and it has been remarked, that in warm climates, where very rare instances of their successful propagation have occurred, the offspring is invariably barren.

Zebra. Zebra.—*Char.* Body of a white or cream colour, with a ferruginous tinge, and ornamented with regular dark brown stripes; tail round, slender, and of moderate length.

This very beautiful animal exceeds the ass in size, and in the wild state is so fleet as to be taken with extreme difficulty. Being of a sociable nature, the zebras range together in considerable herds. Their habits are similar to those of the wild horse and ass, but they do not seem formed for restraint or labour, though there is little doubt they are capable of domestication if caught when young. They are found in Africa, particularly towards the Cape of Good Hope. Individuals of this species, divested of their native wildness, have been frequently exhibited in Britain.

Genus 2. *Hippopotamus*.

Char.—Four large projecting cutting teeth in the under jaw, the two middle longest, and four in the upper, bent on the under side; grinders twelve in each jaw; tusks very strong, and truncated obliquely; lips thick; muzzle inflated; head broad; skin thick; legs short; feet four-toed, and having small hoofs; tail short.

Cuvier has discovered a small fossil species; but only one living species is now known to exist.

Amphibius. Hippopotamus, or River-Horse.

This species is inferior in size only to the elephant, delights in swimming, and is only ferocious when opposed; in which case he will attack boats or canoes, and tear them to pieces. Some have supposed that the hippopotamus is the *behemoth*, so poetically described in the book of Job, to which indeed he seems allied in different respects, though he can by no means be said to move his tail like a cedar; others suppose the elephant to be meant, and that what is translated the tail is the proboscis. This huge and uncouth animal may be in his dimensions compared to the rhinoceros. His body is covered with short hair of a brownish colour, but the skin of the belly, which is less tough than that of the upper parts, is but thinly covered, and appears of a flesh colour. Like the camel, he has a stomach consisting of separate cells. It is chiefly in the African rivers near the Cape of Good Hope that animals of this species are found. Being very sluggish on land, they generally have recourse to the water, where they avoid pursuit by walking at the bottom, only rising occasionally to the surface to obtain air. They feed on the roots of trees, which they loosen with their powerful tusks; and when they quit the rivers, which they commonly do during the night to graze, they are very destructive to cultivated fields, and consume great quantities of rice, millet, and sugar-canes. As they are remarkably furious on land, particularly during the pairing season, any attack made upon them is attended with great hazard. The female produces one at a birth, which she suckles both on the land and in the water, and sometimes carries on her back. Pit-falls are employed by the natives for taking the hippopotamus, which, though viewed as a deity by the negroes of Western Africa, is killed and eaten by them with much satisfaction. Artificial teeth are by dentists formed of the tusks of the hippopotamus, which are preferred for that purpose on account of their hardness and purity.

Genus 3. *Tapir.*

Char.—Cutting teeth ten in both jaws; canine single and bent; five broad grinders on each side of both jaws; fore-feet with four hoofs or toes; hind feet three; tail short.

Two small fossil species have been discovered by Cuvier, but the following is the only living species:

Americanus. American or Long-nosed Tapir.—Similar to an overgrown hog, this quadruped is commonly about six feet in length, and three and a-half in height, of a brown colour, with the hairs on the back remarkably close, short, and fine, and those of the mane black and stiff, and about an inch and a-half long. The upper lip is wrinkled at the sides, and extended into a proboscis about a foot long, in form not unlike that of an elephant; and the tail of the animal is of a tapering form, and extremely short. The female is somewhat larger than the male, and has no mane. It was formerly imagined that the tapir was amphibious, because he swims well, dives in an extraordinary manner, and proceeds along the bottom of deep pools for a great distance, and remains under water for a long time without respiring. When wounded or pursued, he generally escapes to the water.

In his description of this animal, M. Bijon fell into a mistake by supposing that it had three divisions of the stomach, and was a ruminating quadruped, whereas it appears from dissection to have the stomach merely contracted in two places. This species of animal is characterised as gentle and timid, rather solitary in the wild state, and very susceptible of domestication. The female brings forth one at a birth, and nurses it with much fondness. The tapir is the largest quadruped of South America. He pastures like a horse, feeds on wild fruits and vegetables, and drinks like the hog. He is timid and harmless, not injuring even the dog that pursues him, is quick in sight and hearing, has a sharp hissing cry, and trots awkwardly, but with considerable velocity. The flesh of this animal is tough and unpalatable, and differs from the ox both in taste and smell; but the hide is well adapted for leather. In Brazil the tapir is known by the name of *anta*.

Genus 4. *Sus*. Hog.

Char.—Cutting teeth from two to six; grinders with tuberculated crowns; tusks extremely long; snout moveable and prominent; feet hoofed and cloven.

This genus consists of about five species, all of which are in their habits very loathsome, fond of any kind of food, and exceedingly prolific. They are generally either eating, sleeping, or wallowing in the mire.

Spec. 1. *Scrofa.* Common Hog.—*Char.* Body bristled; tail hairy, and of moderate length.

According to Dr Shaw, this animal is not indigenous to Britain, though the wild boar is by Mr Pennant thought to have been at one period a native of this country. But it is pretty evident that the wild boar and the common hog are the same species, although the former is rather smaller in size, and has a longer snout, as well as longer and larger tusks.

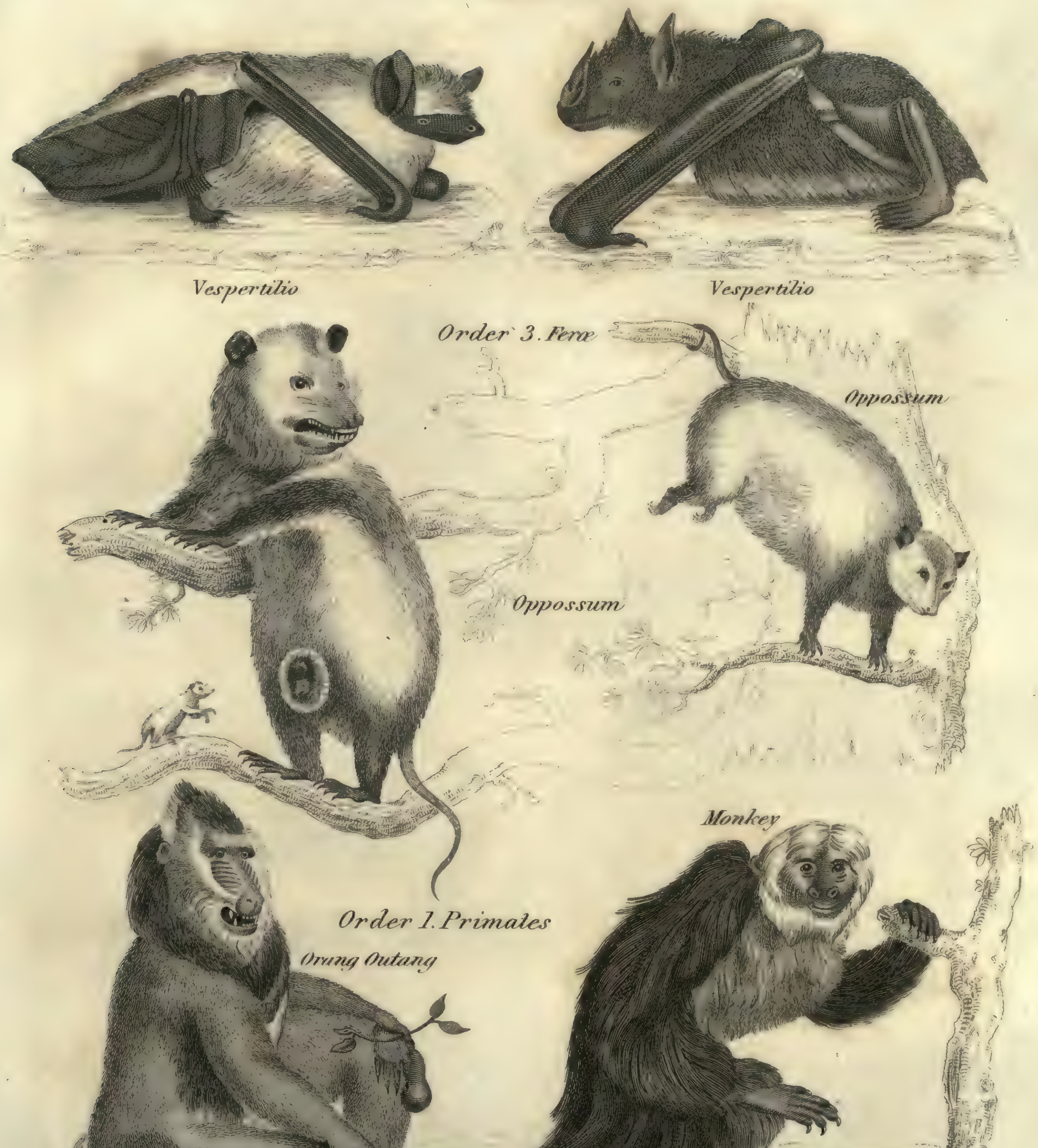
The domestic hog is a stranger in the arctic regions, but abundant in Europe, Asia, and the upper parts of Africa. The female produces, twice in the year, from ten to fifteen at a time. Several varieties are bred in this country, and have already been described. See AGRICULTURE.

In Poland, Germany, and other countries, the hunting of the wild boar constitutes a favourite recreation, though not unattended with danger. These animals, with their young, commonly unite in herds

MAMMALIA

PLATE 113

Order 1. Primates



Vespertilio

Vespertilio

Order 3. Feræ

Oppossum

Oppossum

Monkey

Order 1. Primates

Orang Outang

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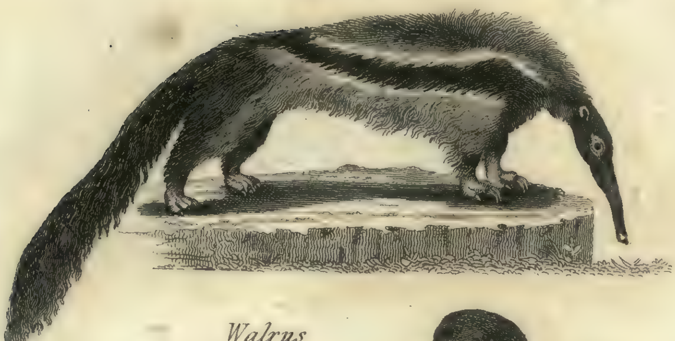
MAMMALIA

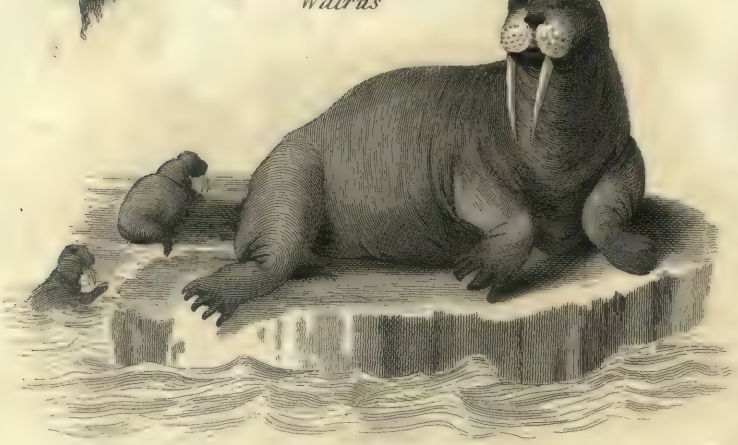
PLAT

Order II. *Bruta*

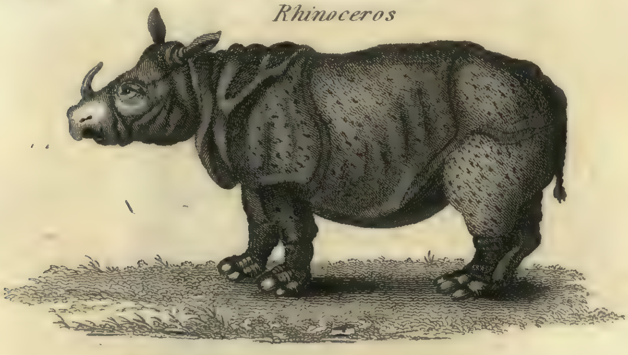
Ant-eater



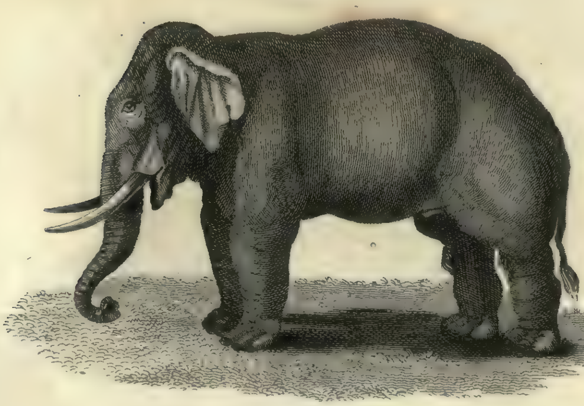
Walrus



Rhinoceros

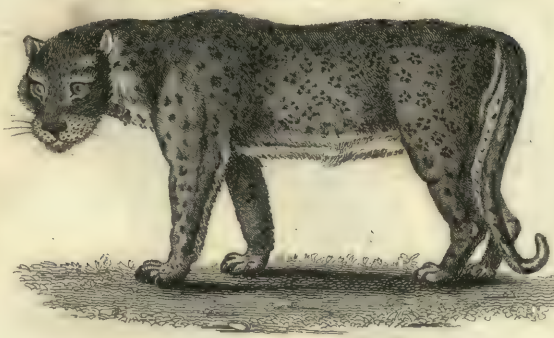


Elephant

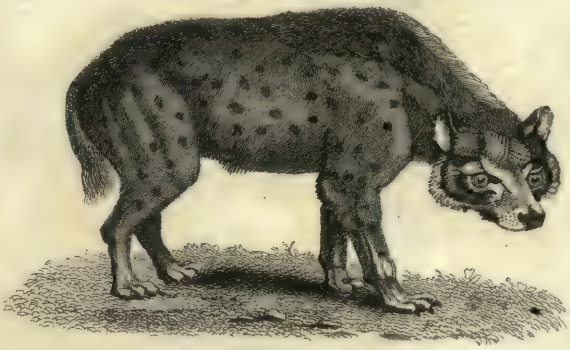


Order III. *Feræ*

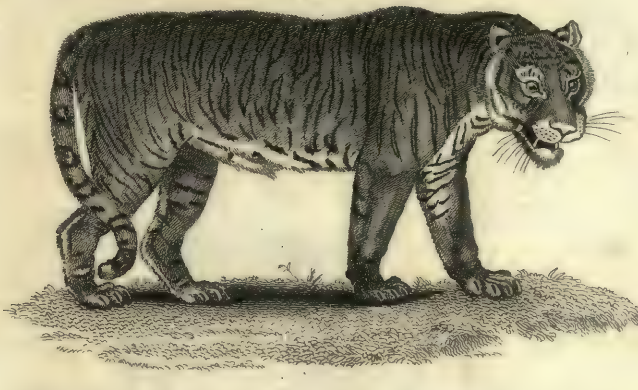
Panther



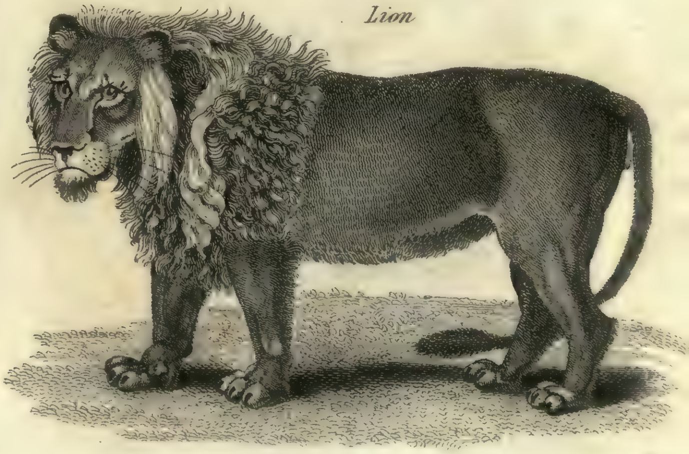
Spotted Hyæna



Tyger



Lion



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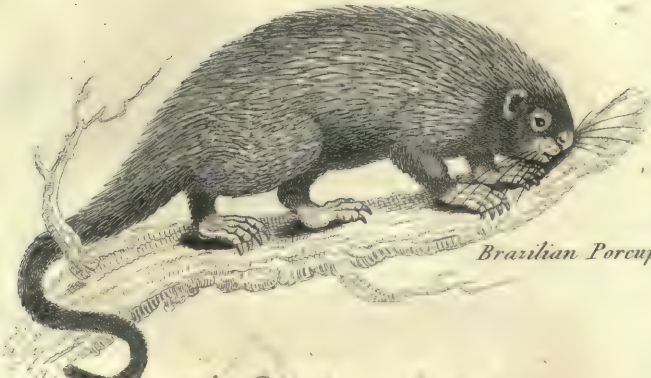
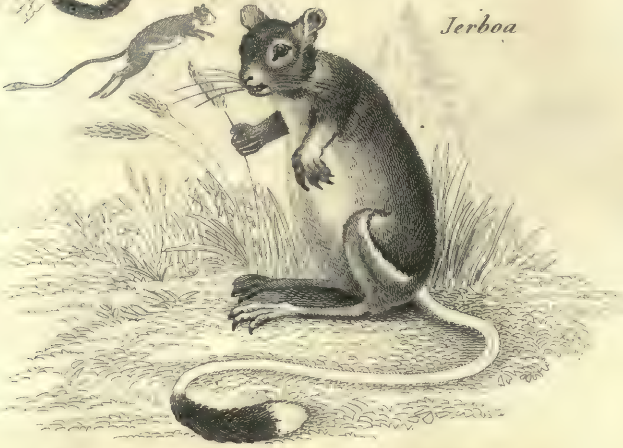
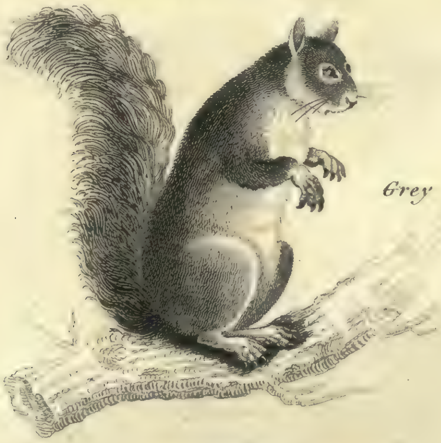
Order IV. *Glires*.



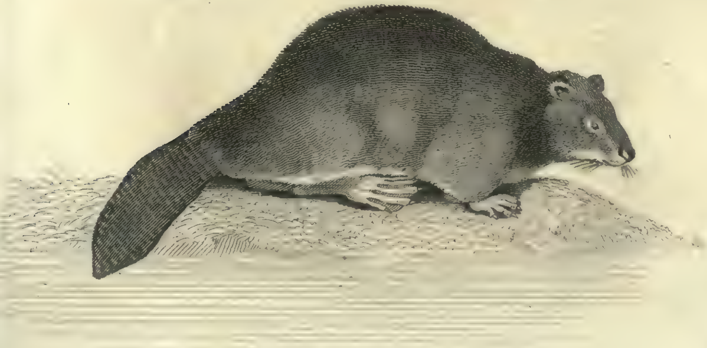
Brazilian Porcupine



Jerboa

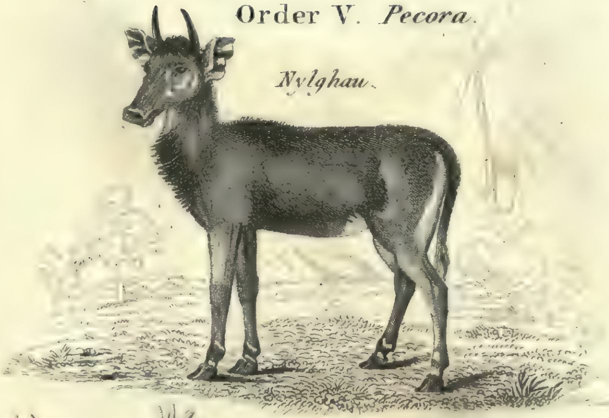


Grey Squirrel

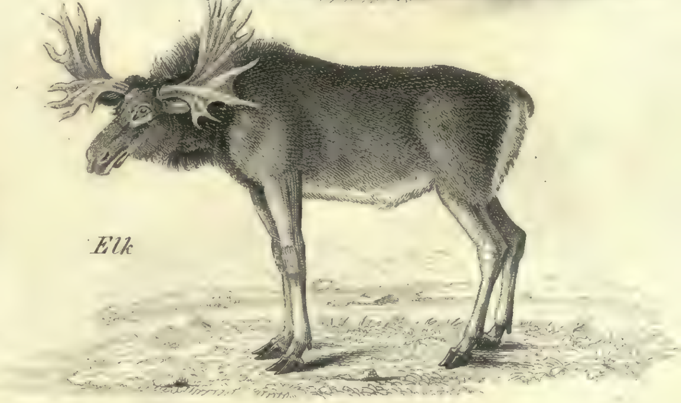


Beaver

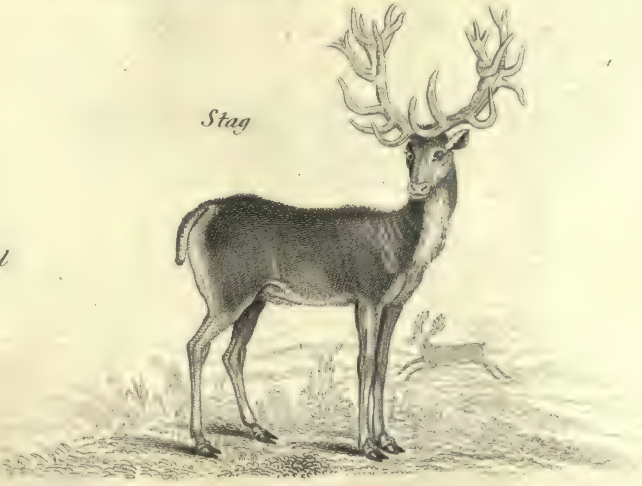
Order V. *Pecora*.



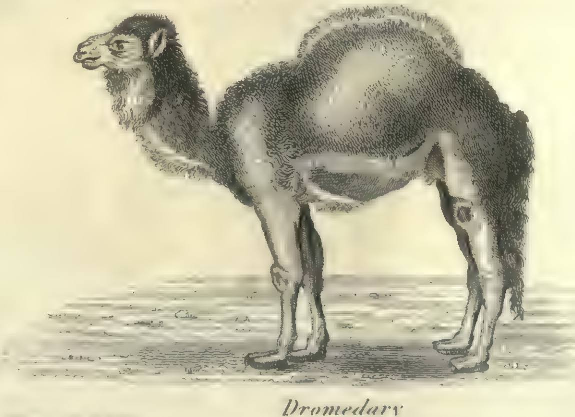
Nylghau



Elk



Stag



Dromedary

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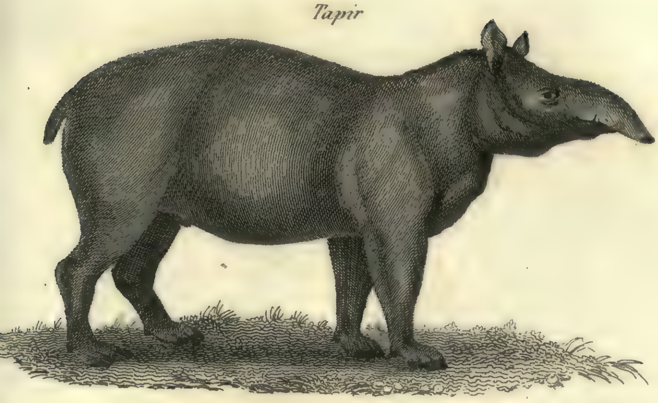
MAMMALIA

PLATE II

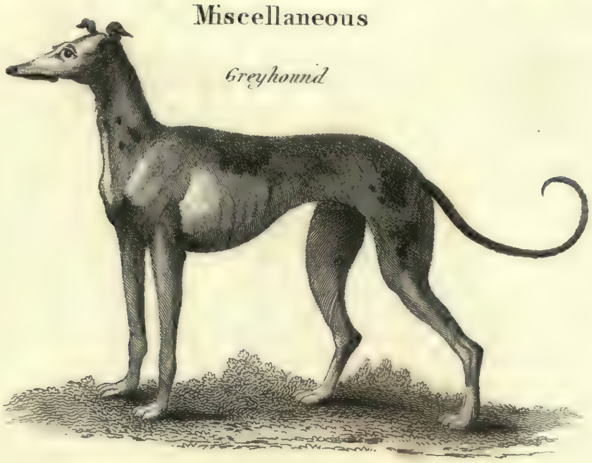
Order VI. Belluæ

Tapir

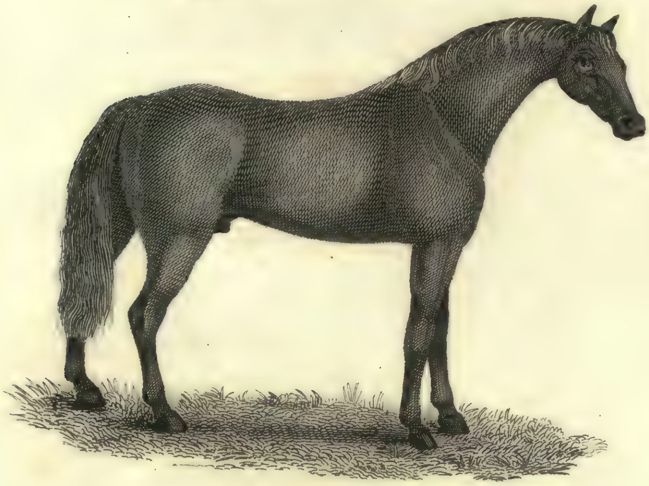


Miscellaneous

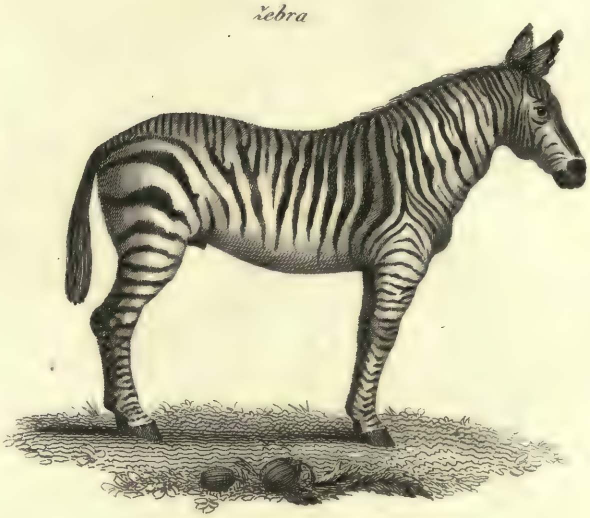
Greyhound



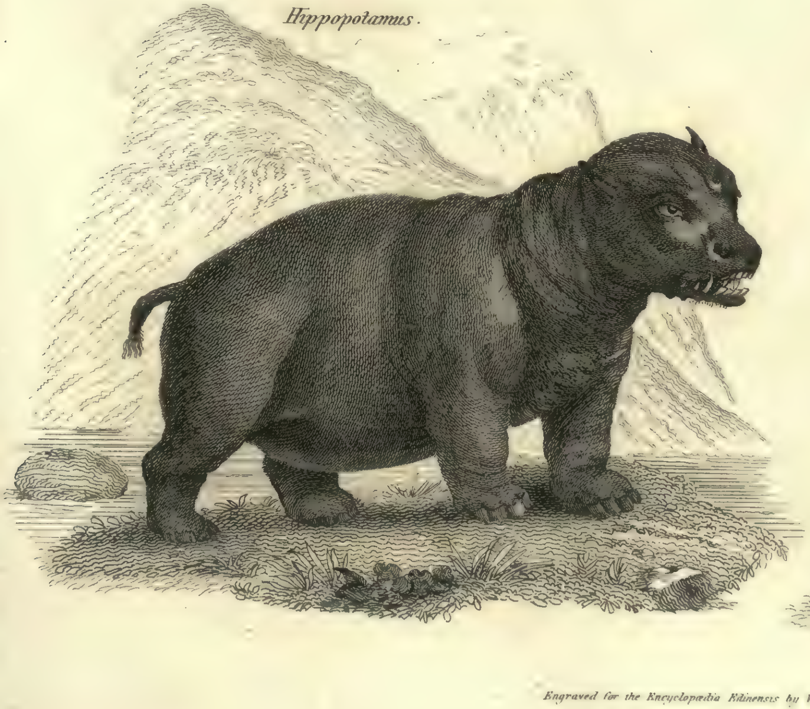
Arabian Horse



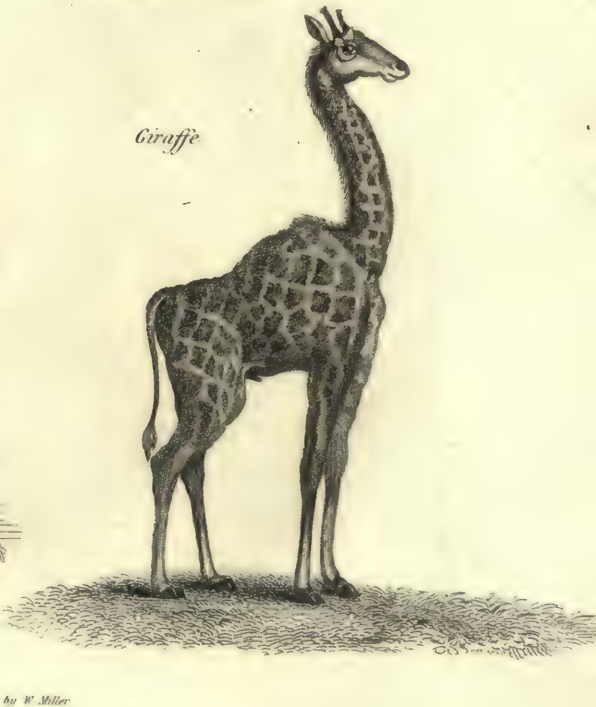
Zebra



Hippopotamus.



Giraffe



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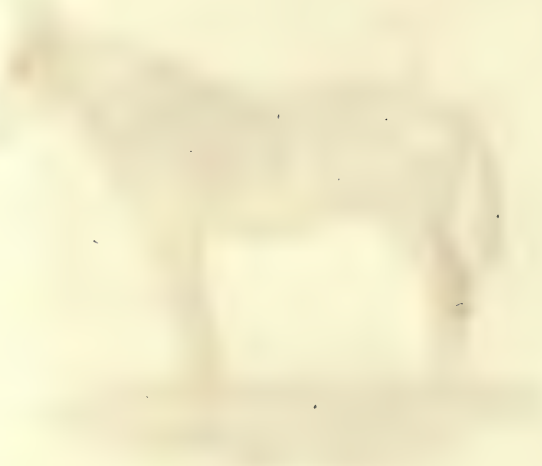


for mutual safety, and the young never appear alone until they are of age to resist the attacks of the wolf. When advanced in years, the wild boar becomes less formidable, in consequence of the growth of the tusks, which assume a curved form, and in a great degree unqualify him from inflicting deadly wounds upon his assailants. He is generally chased with dogs, or caught by surprise during moon-light.

Pork is undoubtedly a most nourishing food, and of great value in a naval and commercial nation from its convenient preservation, as it is more easily cured with salt, and keeps longer than the flesh of any other animal. While the Jews and Mahometans abstain from this kind of food in consequence of their religious scruples, the Chinese are so remarkably fond of it, that this partiality alone, it is said, induces them to decline Mahometanism. With the ancient Romans, the domestic hog was altogether invaluable, as it ministered greatly to the luxury of the table. In most countries the flesh of this animal is of general use, and in England there is a peculiar kind of it known by the name of brawn, partaking more of the nature of gristle than fat, and produced by keeping the animal constantly in a standing posture.

Spec. 2. *Babyroussa.* Babyroussa, or Horned Hog. *Char.* Two tusks above, growing from the upper part of the front.

This species, which abounds in considerable herds in Amboyna, Java, and other Indian islands, is principally remarkable for the peculiar form and position of the upper tusks, which, in place of being fixed on the inner side of the jaw, like those of the other species, are placed without, piercing through the skin of the snout, and bending upwards. They are longer and more slender than the domestic hog, and are covered with brown or blackish woolly hair instead of bristles. They have small eyes, erect and pointed ears, and the tail long and tufted. In sleeping they are supposed to support themselves by hooking their tusks to the lower branches of trees. Their voice is loud and growling. Being good swimmers, they usually escape pursuit by plunging into the water. They are sometimes domesticated, and their flesh is esteemed excellent food by the natives.

Among the other species of this genus are the *Ethiopicus* or Ethiopian hog, with wattles beneath the eyes; the *Africanus*, or Cape Verd hog, having only two front teeth; and the *Pecari*, or Mexican hog, which is tailless.

General Observations.

Under the Article Anatomy, the reader will find the anatomy and physiology of the mammiferous class of animals sufficiently detailed; but should he desire to study these subjects more minutely, the admirable works of Cuvier, Blumenbach, Lawrence, Fleming, and others, will afford the most satisfactory information.

Camper, Daubenton, and some other comparative anatomists have endeavoured to establish a gradation in the proportions of the size of the cranium to that of the face, among the different species of mammalia, with the view of ascertaining the relative proportions of the brain, as well as the degree of intelligence possessed by each of them; it being supposed that the size of the cranium, compared with that of the face, may in general be considered as indicative of the animal's instinctive powers. But while the angles which they exhibit are supposed to determine the relative bulk of these parts, it must be admitted, that, in many of the larger quadrupeds, such as the elephant in particular, the projection of the frontal sinuses must preclude satisfactory correctness in this mode of procedure. The endowments of some animals, however, may be, in some degree, inferred from the proportions which the cranium bears to the face. Thus, in the human subject, especially in a well formed European, the facial angle is greatest; and proceeding downwards in the animal scale, from apes, which bear the nearest affinity to men, it gradually becomes more acute, as in cetacea, fishes, reptiles, and birds.

It is supposed that the animals belonging to the mammalia class, which have been examined and arranged, amount only to about nine hundred. This number obviously constitutes but a small proportion of the multitudes of mammiferous animals which inhabit the surface of the globe; yet, of these, perhaps not more than one hundred prove intrinsically beneficial to man, though, doubtless, all of them have their use in the economy of nature. Several of these appear to be of an equivocal character, forming a sort of link with others of a different class; as the bat and the porcupine, the one having wings, and the other quills, like those of the feathered tribes; the armadillo, which possesses a shelly covering like the snail or lobster; and the morse and seal, which evidently belong to the mammiferous class of animals, though they, in some respects, seem to be more allied to the tribe of fishes.

In contemplating the various species of quadrupeds, each of them will be found wisely adapted by nature to their respective conditions. The rapacious kind have a short thick nose, and jaws of great muscular power; animals of the chace have the nose long, with a remarkably keen scent; and such creatures as turn up the ground in search of their food, are furnished with sharp snouts. But herbivorous animals which require to carry their heads near the ground, are furnished with a long tendinous ligament, extending from the head to the middle of the back; and whilst, to enable them to cut their food, they have the fore teeth edged, the carnivorous species have the teeth particularly sharp. Quadrupeds of large size and great strength, and which are not particularly designed for pursuit or flight, have thick massy legs, for the support of their unwieldy bodies; while fleeter animals, such as the antelope, the deer, and the hare, which provide for their safety by flight, have long slender legs, and most powerful muscles. Rapacious animals have their feet armed with sharp claws, which in some species are retractile; animals naturally of a peaceful disposition, are in general provided with hoofs for their defence; and such species as subsist on fish have membranous feet which qualify them for swimming, so that, with the greater facility, they may thus be enabled to catch their prey. Those

Classification

of the carnivorous species during the day time usually confine themselves to their retreats, and during the night roam about for prey, which most of them seize by surprise, whilst others unite together in groups for mutual plunder.

The larger quadrupeds are generally harmless and inoffensive, though when provoked they frequently exhibit the greatest courage. In their natural state, all animals, in a greater or less degree, possess the means of self-preservation and defence, and endeavour to protect themselves either by strength and courage, fleetness or cunning. The more defenceless find their protection in holes, or escape by flight; some succeed by collecting themselves in numbers, when individually they are insufficient in strength; and others again appoint sentinels to warn then of the approach of danger. But those quadrupeds that have become domesticated, and have thus lost their natural freedom and means of defence, such as the cow and sheep, by devoting themselves to the service of man, naturally look to him for protection.

In their size and qualities, quadrupeds are found to vary in different climates. Those indigenous to warm and dry countries are in general strong and vigorous, whereas such as belong to a moist and warm climate are commonly luxuriant and tender. Under the tropics, the different species have but a scanty covering, whilst in the high northern and southern latitudes, their clothing is warm and compact. There is also a much greater variety in colour, size, and shape, among quadrupeds that are domesticated than among those in the wild state; while at same time a material change is also observable even in their natural propensities and dispositions; and it has been remarked that, in the different countries in which they are found, they seem to partake of the barbarity or civilization of the human race.

Those who have made natural history their particular study, cannot fail to observe the wonderful sagacity of different animals, and how powerfully they are led to use those weapons of defence with which nature has endowed them. From mere instinct the dog knows how to defend himself with his teeth, the horse with his hoofs, and the tiger with his claws; and not one of the different species of animals ever makes use of any other mode of defence than that which is peculiar to their kind.

It would be easy to enlarge on the great utility of this branch of natural history, which has occupied the attention of the most eminent philosophers. Suffice it to say, that this study is not only important in point of instruction and amusement, but possesses no small degree of advantage, as an elucidation of natural theology, being highly adapted to excite our admiration of the wisdom and goodness of the author of nature.

Index.

INDEX.

A
Aguti, 683
Antelope species 693
Ant-eater, 657
Ape species, 651
Arcuranus 690
  Chilihuque, ib.
Arctic fox, 673
Arctomys, 686
Armadillo 658
Ass, 699
Aries, common sheep, 697

B
Baboons, 652
Babyroussa 701
Bactrian camel, 688
Badger, 679
Ban dog, 668
Bat species, 655
Beagle, 669
Bear, common, 678
  white, or polar 679
  American, ib.
Beaver, 683
Behemoth, 700
Belzeebul, or Preacher monkey, 653
Belluæ Order, 698
Bison, 697
Bloodhound, 669
Bos Genus, 696
  taurus, ib.
  bison, 497
  bubalus, ib.
  moschatus, 698
  grunniens, ib.
Bradypus, 657
Bruta Order, 657
Buffalo, 697
Bull-dog, 667

C
Camel, 688
Camelopardalis, 692
Canis Genus, 666
  lagopus, 673
  lupus ib.
  hyæna, ib.
  vulpes, 673
Canis aureus, ib.
Capra Genus 695
Castor 683
Cat 675
Cavia Genus, 683
Cavy, variegated, ib.
Cervus Genus, 690
Chamois, 694
Civet, 677
Coach-dog, 668
Cur-dog, 666
Coypou, or beaver rat, 686

D
Daman, or hyrax, 688
Dasypus, 658
Dasyurus, 680
Deer, 690
  rein, 691
Didelphis, 680
Dipus Genus, 687
Dog species, 666
  diseases of, 671
  characteristics, &c. ib.
Dormouse, 687
Dromedary, 689

E
Elaphus stag, 691
Elephant, 661
Elk, 690
Equus, 698
  caballus, ib.
  asinus, 699
  mule, ib.
  zebra, ib.
Erinaceus Genus, 682
Ermine or stoat, 677
English mastiff, 667

F
Fallow deer, 692
Familiaris, or common dog, 666
Felis Genus 674
  leo, ib.
  tigris, 675
  pardus, ib.
  leopardus, ib.
  catus, ib.
  lynx, 676
Feræ Order, 665
Ferret, 676
Fox, 673
Fox-hound, 669
Foumart or Fitchet, 678

G
Galeopithecus, 654
Gazel, 693
Giraffe, 692
Glires Order, 682
Glutton, 679
Gnu, 694
Goat, common 695
Guinea-pig, 683
Greenland-dog, 667
Greyhound varieties, 668

H
Hamster, 685
Hare, 688

Harrier, 669
Hedgehog, 682
Hinny 699
Hippopotamus, 700
Hog species ib.
Horse, 698
    river, 700
Hyæna, 672
Hydromys, new Genus, 685
Hyrax Genus, 688
Hystrix Genus, 682

I

Jackal, 673
Ibex, 695
Ichneumon, 677
Jerboa, 687
Jickta, 698
Jubata, or hunting leopard, 673

K

Kanguroo, 681
Klipp-springer, 693

L

Lama, 690
Lemur, 654
Leopard, 675
Lepus Genus, 688
Lion, 774
Lurcher, 668
Lutra, 678
Lynx, 676
Lyemmer, 668

M

Mastiff, English, 667
Macauco 654
Macropus, 681
Mammalia, definition, 649
    works on, 650
    classification of, ib.
    observations on, 701
Manis, 658
Marmot, 685
Megatherium, 657
Martin, 677
Meles, badger, 679
Mole, 681
Monkey tribe, 653
Moose deer, 690
Moschus, ib.
Moschatus, 698
Mouflon, 696
Mouse species, 684
Mule, 699
Mus Genus, 684
Musk, 690
    ox, 698
Mustela, 678
Myoxus Genus, 687
Myrmecophaga, 657

N

Newfoundland dog, 670
Nylghau, 693

O

Observations, general, 701
Opossum, 680
    spotted 681
Orang-Outang, 691
Otter, 678
Ounce, 675
Ovis Genus, 695
Ox, common 697

P

Panther, 675
    pasan, 693
    pecari, 701
Pecora Order, 688
Phoca, 665
Platypus Genus, 664
Pointer, Spanish, 670
Polecat, 678
Porcupine, 682
Preacher Monkey, or Belzeebul, 655
Primates Order, 651
Pug-dog, 670
Puma, 675

R

Rabbit, 688
Racoon, 680
Rat species, 684
Rein deer, 691
Rhinoceros 659
Roe, 692

S

Sable 677
Sapajous, 653
Satyrus, 651
Sciurus, 686
Scrofa, 700
Seal, 665
Setter, English, 670
Sheep, 695
Shrew, 682
Simia Genus, 651
    satyrus, ib.
    inuus, 652
    sylvanus, ib.
    sphinx, ib.
Sloth, 657
Sorex, 682
Sphinx, 652
Squirrel, 686
    flying, 687
Stag, 691
Stoat, 677
Sukotyro Genus, 664
Sus, 700

T

Talpa Genus, 681
Tapir 700
Tarandus, 691
Terrier, 669
Tiger, 675
Trichecus, 664
Tumbler, 669

V

Vampyre bat 656
Vespertilio, 655
Virginian deer, 692
Viverra Genus 676
Vulpes, 673
Vulgaris, common Weasel, 676

U

Ursus Bear, 678

W

Walrus, 664
Wapeti, or gigantic stag 691
Weasel, 676
Water-dog, rough, 670
Wolf, 672
Wombat, 680

X

Xenophon, his fable of the Sheep and the Dogs, 672

Y

Yak of Tartary 698

Z

Zebra, 699
Zebu, 697

MAMMON, according to some, was the god of riches; but, according to others, the word merely signifies riches. Mammon is elegantly depicted in Milton's Paradise Lost, as one of the fallen angels.

MAMMOTH, a huge animal, supposed to have belonged to the genus Elephas. Numerous specimens of the tusks, bones, and skeletons of an animal of vast magnitude, have been discovered in various places of the north of Europe and America, which have been supposed to belong to the mammoth, and several of which specimens are deposited in the Imperial cabinet of Petersburgh, and may also be seen in some of the museums of Great Britain. Muller, in his description of this animal, says, "it is four or five yards high, and about thirty feet long. His colour is greyish. His head is very long, and his front very broad. On each side, precisely under the eyes, there are two horns, which he can move and cross at pleasure. In walking, he has the power of extending and contracting his body to a great degree." Similar to this is the description given by Isbrandes Ides. Whether this huge animal still exists, is however extremely doubtful. See GEOLOGY.

MAMRE, in Scripture history, an Amorite who dwelt near Hebron, and after whom great part of the surrounding country was named; for it is said that Abraham dwelt in Mamre, and in the plain of Mamre. Gen. xiv.

MAN, the noblest and most excellent of all the creatures that inhabit this globe, is connected with the mammiferous class of animals, through the medium of the oran-outang, whose structure of body, in several respects, resembles the human, and who is supposed by the unenlightened barbarian to differ from him scarcely in any particular but in that of the want of speech. It may, no doubt, appear somewhat surprising, that man, a single genus, and, as must be admitted, a single species, should be made to constitute a distinct class; but when we reflect on the superiority of the human race in the scale of existence, and the faculties, moral and intellectual, by which man is so much exalted above all the other tribes of animals with which he is surrounded, there does not appear any impropriety in forming the human race into a separate class. Indeed the theory maintained by Lord Monboddo, and some other physiological writers, that both man and the ape species have sprung from the same origin, seems altogether unworthy of countenance, or of any serious refutation.

In contemplating animated nature, it is impossible not to observe the nice connection existing in every part, and the similitude subsisting between the human species and the inferior animals, which is so obviously striking in their structure and organization. Man, however, peculiarly the emanation of the divinity, although enveloped in a form of clay, exhibits proof of his high origin, in the admirable structure of his whole frame, the beautiful arrangement of his features, and more especially in his powers of reflection, thought, and invention, as well as his surprising capability of carrying into execution his conceptions or plans. Of all the terrestrial animals, indeed, man, having the most perfect conformation of body,—replete with life, and having concentrated in him the highest powers of nature,—appears, as it were, an abstract of creation,—the offspring and the sovereign of the earth. Peculiarly adapted for society, he alone enjoys the inestimable faculty of communicating ideas by means of letters and speech.

But while intellect, or the enobling faculties of the soul, thus constitute the grand prerogative of man, the animal race are wonderfully endowed with strength and sagacity; and if the similarity which the former bears to the latter may be viewed by the more fastidious as a sort of bodily degradation, it ought, on the other hand, to be a most powerful stimulus to a noble and virtuous elevation of mind; for " he who has a mean opinion of the dignity of his nature, will act in no higher a rank than he has allotted himself in his own estimation." Yet, viewing man in the possession of all his distinguishing excellencies, how vastly indebted is he to the influence of cultivation, and how humiliating is the consideration, that, in an uncivilized state, he evinces comparatively little superiority above the beasts that perish!

It is perhaps not unworthy of remark, that, in a full survey of what relates to our own species, almost all that is interesting in nature is necessarily embraced; and an *Encyclopædia* may not unaptly be considered as comprising a series of facts and reasonings, either mediately or immediately applicable to the improvement and welfare of the human race. Thus, the subject of the organization of man is in this work detailed under ANATOMY; the various disorders incident to the body, together with the most effectual means of recovery, are treated of under MEDICINE, MIDWIFERY, SURGERY, and MATERIA MEDICA; the intellectual powers of man are discussed under LANGUAGE, MATHEMATICS, MIND, and other heads; and his obligations, moral and religious, are inculcated under MORAL PHILOSOPHY and RELIGION.

In treating of a subject of this nature, it is impossible to overlook the wonderful diversity that subsists among the human species, and how surprisingly, in different countries and climates, man differs from himself. Although all originally sprung from the same stock, mankind, nevertheless, vary remarkably in complexion, features, faculties, and manners, from peculiarity of climate, soil, food, customs, and the like; and they have been accordingly divided, by writers on natural history, into particular classes. Nations the most polished are distinguished from each other by characteristic features, or the colour of the skin; and not unfrequently the chief boundary between two barbarous tribes is constituted merely by a river, while their dissimilarity in the tincture of the skin is not less striking than that of the dispositions of their mind. But while there appears an astonishing variety of features, notwithstanding the general approximation of countenance in nations and tribes, the traits of the face in individuals are sufficiently marked to enable us to recognize almost any person whom we have once fully observed.

In distinguishing the varieties of the human species, philosophers have entertained different ideas. Linnæus particularizes five varieties, namely, Americans, Europeans, Asiatics, Africans, and monsters; and under the latter head, he includes the natives of the northern mountains, who are small in stature, active, and of timid disposition; the Patagonians of South America, formerly considered of gigantic size; and the Hottentots, who have one testicle extirpated; those of the American nations, who eradicate their beards and all the hair excepting that of the scalp; and the Canadian Indians, with flatten foreheads.

Buffon mentions six varieties: The Polar or Lapland race, the Tartar or Mongul, the southern Asiatic, the European, the Ethiopean, and the American.

In the *Tableau Elementaire de l'Histoire Naturelle des Animaux* of the celebrated Cuvier, is given the following classification of the inhabitants of the globe: 1. The white race, with oval visage, long hair, pointed nose; to which belong the polished natives of Europe and great part of Asia. 2. The inhabitants of all the northern parts of the two continents, which are very dark, with flat visage, black hair and eyes, with a body thick and extremely short. To this belong the Laplanders in Europe, the Samoiedes, Ostiacs, Tschutski in Asia, the Greenlanders and Esquimaux in America. 3. The Mongul race, to which belong most of the people whom we call Tartars, as the Monguls, the Calmucs, &c. 4. The negroes which inhabit all the coasts on the south of Africa, from the river Senegal to the Red sea. Besides the blackness of their skin, they are distinguished by their flat nose and forehead, their long muzzle, prominent cheek-bones, and woolly hair. 5. The original inhabitants of America, which was peopled with men of a copper colour, with long and coarse hair, who, according to most travellers, generally want the beard, and even the hair on the body.

Besides the above, another variety has been supposed to exist, in the race denominated Albinos, who are already described in the order of the alphabet. They cannot properly, however, be considered as forming a separate breed, since their offspring never fails to return to the original colour of the natives.

Man, as appears manifest from a survey of the varieties of his species, is an inhabitant of the world at large, and qualified to make use of all kinds of nutriment. Besides himself, very few animals are able to sustain the extreme cold of the polar regions, and the scorching heat of the equatorial. The differences, however, which exist between the inhabitants of different quarters of the world, are so remarkably striking, that even the most cursory observer is naturally led to inquire, from what cause have sprung such diversities of his race? On this head, nothing surely can be more preposterous than to imagine, that the varieties of men are so many distinct species; yet philosophers, it is true, are not wanting who have maintained such doctrine, although calculated to impugn the consistency of the Mosaic account of the creation, which they inconsiderately view as merely allegorical.

Independently of moral and physical causes, which doubtless must have occasioned the diversity in question, the circumstance of all the varieties being capable of intermixing and producing offspring, which hold a medium between the forms and colours of their parents, certainly militates against the inference that the varieties of mankind constitute so many distinct species. Respecting the creation of our race, and their subsequent dispersion over the globe, the account given in the book of Genesis ought perhaps entirely to supersede any argument on the subject; for it is clear, that, failing to trace the succession of our species from its commencement downwards, in a perspicuous manner, it is improbable that any particular tribe can be traced to its origin from the present stock. " Neither the annals nor traditions of nations," says an able historian, " reach back to those remote ages in which the different descendants of the first pair took possession of the different countries where they are now settled. We cannot trace the branches of this first family, nor point out with certainty the time and manner in which they divided and spread over the face of the globe. Even among the most enlightened people, the period of authentic history is extremely short, and every thing prior to that is fabulous and obscure."

It is remarkable, that there is no point of difference between the several tribes of mankind which has not been found to arise in at least an equal degree among quadrupeds; a position finely illustrated in a comparison between our race and other animals, by the ingenious Professor Blumenbach, to whose work the reader is referred. In tracing the variations of mankind, therefore, from the original stock, the powerful influence of climate, manner of life, state of society, and other causes, should be duly considered.

Climate, it is evident, very much affects the animal economy and the appearance of the external form. Thus the fox, hare, falcon, crow, and black-bird, in northern regions, assume a white colour from the extreme cold of the climate, and in different countries the colour of the common bear is materially different. In the northern provinces of France the swine are uniformly white, but in Dauphiny and some other parts they are black, as also in Italy, Spain, India, China, and America. To the influence of climate is attributed the remarkable blackness of the fowls and dogs on the coast of Guinea, and the change of the woolly covering of the ovine species into hair in the same country. In this way, likewise, the peculiar white silky covering of some animals in Angora, a district of Asia-Minor, is to be accounted for. That climate affects the stature of the body likewise appears more than probable, from the comparative smallness of the horses in the northern isles of Scotland and in North Wales, as well as in the provinces of Sweden; and on the same principle, perhaps, may be explained the degeneracy of the horses in France; for Count de Buffon affirms, that the Spanish or Barbary horses, where the breed is not crossed, degenerate into French horses in the second or third generation. The effect of climate is modified frequently by the circumstances of a low or elevated position, by seas and lakes, by clothing as well as by the state of society and the manner of life; and it has even been remarked, that the children of Europeans born in the East or West Indies may be easily distinguished from their relations born in Europe.

Food, likewise, has a wonderful influence on the colour, size, and appearance of different animals. The lark and finch, when fed entirely on hemp-seed, are observed to become gradually black. An African sheep, imported into England, has been observed to change the hair from its coarse nature to considerable fineness and softness, in consequence of a single year's feeding on the pasture of this island. The stature and proportions of the body are affected by the same causes. Thus, the horse, which grows to a large size in the marshy lands of Friesland, invariably remains dwarfish if confined to dry heaths and stony soils. In rich soils, oxen become fat and of large size, and have the legs short; whereas their bulk is much inferior, and the limbs more strong and fleshy, when they occupy drier situations.

The *manner of life*, by which is meant all those causes, besides climate and food, which affect the body by their long continuance, occasions considerable changes. For example, how very efficacious is the influence of culture and habit, as observed in domesticated animals. The wild horse rather bites than kicks, while the same species, tamed in the manege, armed with iron shoes, and reined, uses these as his means of offence. By having the ears long and tail pendulous, most domesticated quadrupeds indicate their being in a state of subjugation. Indeed, the very functions of the body are not unfrequently influenced, as in the case of the sow, which in the domestic state produces twice a year, whereas she produces once only in the wild state. The accumulation of fat beneath the skin, in the domestic pig, does not occur in the wild animal, which among its bristles has an intermixture of soft downy hair.

The changes induced by these individual causes are found, from experience, to be more speedily communicated by the process of generation; and as breeding from different varieties affects the form and colour of the animal produced, the improvement of the breed of the horse, sheep, and other domestic animals, are thus practically attended to, and changed into different sizes, qualities, and forms.

From these, and similar facts, we may safely infer, that all the varieties of the human species may be satisfactorily accounted for by the infinite changes that take place from climate, food, manners, and habits of life. The burning heat of the torrid zone never fails to darken the complexion, even in the course of a few years; and how great must be this change in the course of many generations? The muscular strength and size of the limbs may be vastly increased by the habitual exercise of running and leaping; and the same muscular power may be communicated to the arms by the habitual use of the sword and the saw, or by the constant application of the arms in any mechanical operation. How limber and active, how swift and hardy, the human frame becomes by proper training, exercise, and food, every one may judge, who reflects at all, upon the surprising feats that have been witnessed and recorded respecting the performances of couriers and jugglers in India, rope-dancers, and others, who have early devoted their lives to these and other such employments. The external form of the human body accustomed to a spare diet and hard labour, will be materially changed if richly fed and restrained to a state of indolence and inactivity. As the size and colour of other animals is not a little affected by food, shelter, heat, and cold, so therefore, we may infer, will the same causes operate in producing a change on man.

That climate is the chief, if not the sole cause, of national colour, has been generally admitted, and, in producing these changes, great influence has been ascribed to the light and powerful heat of the sun. It is indeed obvious, that the natives, under every parallel of latitude, are distinguished by their peculiar colour and complexion. Under the tropics may be observed the copper colours, and dark brown; and from the tropic of Cancer, in a northerly direction, may be traced the olive in all its intermediate shades to the delicately fair; while under the equator the colour is uniformly black. It may also be observed, that a native of Europe, when much exposed to the sun and air, becomes brown in summer, and again recovers his sanguine complexion during the cold of winter. In Asia and Africa, the women, who are confined within the walls of the seraglio, have a complexion generally as fair and white as those of Europe, while such as are constantly exposed to the scorching rays of the sun are as dark in their colour as the men. The Moorish children are originally of a fair and sanguine colour, which, in the males, who are exposed to the sun, becomes dark and swarthy, but is preserved in the females, who seldom venture without doors, and are commonly veiled. In the great and extensive empire of China may be seen every variety of complexion, from the fair to the black, according to the latitude of the country to which they belong. But although some Europeans may be but little affected by changing to a hot climate, this no doubt may happen from their avoiding the heat of the sun, and from their different clothing and food, by which means they evade the causes which operate with such powerful energy on the natives themselves.

According to Blumenbach, the proximate cause of the dark colour of the skin consists in the secretion of a greater quantity of carbon, and its fixation by an union with oxygen in the *rete mucosum.* Negroes, he maintains, acquire the black colour by the action of the atmosphere, and are not dark when born. He also states, that the influence which heat exerts on the hepatic functions is very powerful, and that the sympathy existing between the liver and skin, exhibited by the dark tinge of the latter, is abundantly manifest in persons of an atrabilarious temperament and habit, and that Africa is peculiarly favourable to the operation of these causes. Hence the inhabitants of that country, having been exposed to these agencies for a series of ages, have acquired this deeply rooted character, and transmitted it unimpaired to their descendants in other climates.

In taking a comprehensive view of the human race, nothing can be more interesting than to contemplate the progressive stages of his existence. The infant, at its birth, is exposed to a new element, the air; and though it is impossible to ascertain what the sensations are on the admission of this element into the lungs, we may conjecture, from the cries of the infant, that it is attended with some degree of pain. Under these sensations, man, at the commencement of his career, appears at once an object of want and helplessness; and did not his very impotence insure the fondest sympathy and protection, he would not long survive. Of a new-born infant, the height is usually about twenty-one inches, and its weight from ten to fifteen pounds; but the form of its body and its members are not perfectly completed; and the external senses are also remarkably feeble and imperfect. The infant at first passes the greater part of its time in sleep, and whenever it awakes uniformly applies its lips to the mother's breast. The bile and the hepatic system commence the exercise of their functions in the course of a few days, when a slight degree of jaundice is perceptible. In the course of about forty days, and sometimes earlier, the infant begins to smile, and to observe those who are commonly about it. The period of dentition usually commences at the age of seven months. Contrary to what occurs in most of the processes of the animal economy, the cutting of the teeth is attended with violent and painful symptoms, accompanied with cries and tears. In eight or ten months the eight incisors, four of which are placed in front of each jaw, generally make their appearance; about the tenth month, the four eye or canine teeth pierce the gum; and about the twelfth month are protruded the sixteen grinders or jaw teeth; and by the developement of the *dentes sapientiæ,* or *wisdom teeth* as they are called, the whole number, thirty-two, is completed. The latter teeth, however, are of tardy appearance, not being obtained by the individual till the age of twenty-five or sometimes thirty years.

It is observable, that the frame of infants, notwithstanding their extreme delicacy, is less sensible of cold than during any other season of life. This arises from a great degree of internal heat being induced by the rapid circulation. In European infants, the hair is usually very light, but in the other varieties of the species dark. The new-born infants of people of colour are reddish or white, but, even without exposure to the rays of the sun, they progressively acquire their appropriate tint. About the age of twelve or fifteen months, the first efforts to lisp are made by children; and it appears that the first sounds uttered by them are produced by the compression and opening of the lips, and a violent or forcible breathing. At the age of two years and a-half, or three years at most, children pronounce words with a decree of accuracy; and females, it has been observed, are in general the most expert in the acquisition of this valuable qualification. In their growth children are very rapid, and more so perhaps in summer than in winter, but in some, more than others, the growth is remarkably quick. The approach of the age of puberty is affected not a little by sex and climate. Its commencement, in our temperate latitudes, may be dated at the age of fourteen in females, and sixteen in males. In the arctic regions, the former rarely attain this stage of life till the age of eighteen or twenty years, and the latter not till they reach eighteen or nineteen. On the other hand, a Hindoo or Arab youth arrives at maturity at fourteen or fifteen, and a female at ten or twelve, though such prematurity is uniformly succeeded by early decay. There are likewise other circumstances, such as food, tendencies of constitution, together with moral causes, all of which hasten and affect the state of puberty.

The vital functions during infancy and childhood, while they exerted their energies on the organs of nutrition, and on the cellular and lymphatic systems, thus promoted the general growth. But the vital efforts, as the individual rises to the state of maturity, are chiefly directed to the glandular and generative systems, and a considerable alteration is at the same time occasioned in the organs of voice, owing to the enlargement of the muscles of the glottis.

The period of adolescence is the spring-time of existence, the season of pleasures and delightful hopes; but, alas! its continuance is experienced to be very short. The body of man, subsequent to the age of puberty, arrives at its full stature. This term is, however, equivocal, as some individuals cease growing at the age of fourteen or sixteen, while others continue their growth till about twenty-two years. At the age of thirty, man is in his fullest perfection as to intellect, symmetry, and muscular power; and he is then peculiarly qualified for the performance of the various duties, as well as for the enjoyment of the rational pleasures of life. The period of manhood extends from the age of thirty or thirty-five, to that of forty or forty-five; and during this stage the alteration in his figure is induced by the formation of fat in different parts of the body. From forty or forty-five, to sixty or sixty-five, commences the decline of human existence; and the symptoms of decay, indicating old age, usually become more and more visible at sixty, sixty-three, or sixty-five. See ANATOMY and LONGEVITY.

It is obvious, that the perfect term of their existence is by very many of the human race never attained; for, during the season of infancy and childhood, multitudes are prematurely cut off, and even in the flower of youth numbers daily perish. In short, individuals of our race are constantly disappearing, though the species still continues to flourish. The probabilities of life are satisfactorily deduced from the tables of mortality; and from an examination of these it has been estimated, that, of the children born in the course of a year, one-fourth commonly die before the termination of five years; one-third before the completion of ten; one-half before the lapse of thirty-five; two-thirds before the completion of fifty-two; and three-fourths before the revolution of sixty-one years. Of six or seven children born in the same year, only one on an average arrives at seventy years; of ten or eleven one attains to seventy-five; of seventeen, one arrives at seventy-eight; of twenty-five or twenty-six, one advances to eighty; of seventy-three, one attains to eighty-five; of 205, one lingers on to ninety; of 730 one exists to ninety-five; and of 8179, one perhaps lives 100 years. Respecting the extended term of human existence immediately subsequent to the creation of the world,—see ANTEDILUVIANS.

MAN, ISLE OF, an island in the Irish sea, about thirty miles in length, ten in breadth, and above seventy miles in circumference. It is traversed by a considerable group of lofty mountains, the highest of which, Snafield, rises nearly 2000 feet above the level of the sea. This island enjoys a temperate climate, and the soil is remarkably productive of corn, potatoes, turnips, and flax. The breed of sheep and cattle is excellent; and great numbers are annually exported, together with pork, butter, and eggs, which are sent to England. The herring-fishery is successfully carried on here, and occupies more than 500 boats. The population, in 1792, was stated by Dr Berger at 28,000; but it has been likewise estimated so low as 23,000. The linen manufacture is extensive; besides which, are fabricated cotton goods and coarse hats. The Ramsey is the principal river; and the chief towns are Castletown, Douglas, Peel, and Ramsey, besides which there are several villages. *Castletown*, the capital of the isle of Man, is spacious and regular, and contains a chapel and a freehold. The strong fortress of Castle-Rushen stands on a rock in the centre of the town. This place was the residence of the ancient sovereigns of the island. *Douglas* is remarkable for the stately mansion of the duke of Athol. It contains a handsome chapel and a free school; and a pier and lighthouse have been erected at an expense of L.20,000. The bay admits vessels of 500 tons. *Ramsey* is a neat small town, with a harbour and fort, from which boats sail weekly for Whitehaven and Liverpool. *Peel* is finely situated on the west side of the island, and contains a grammar, a mathematical, and a free school. The sovereignty of this island was disposed of to the crown in 1765 by the duke of Athol. The jurisdiction is vested in the bishop of Sodor and Man, who has no seat in the British parliament.

MANCHA, La, a province of Spain, situated between Andalusia and the river Guadiana, extends about 43 leagues in length and 33 in breadth, and consists of Upper and Lower. It is one wide plain, with occasional ridges of low hills and rocks, and very few trees; but vines, potatoes, melons, saffron, and honey are abundant. An immense quantity of mules are reared between Ciudad Real and Santa Cruz de Mudela. The mines afford a variety of minerals, among which are iron, antimony, bole, calamine, cinnabar, and ochre. La Mancha was formerly very rich in manufactures. Those still carried on to any considerable extent are lace, flannels, soap, gunpowder, and saltpetre. This province supplies the neighbouring ones with oats, wine, lace, and shoe-leather; and it imports salt provisions, spices, shot, hardware, and linen, woollen, and silk stuffs. The population is stated at 206,180.

La Mancha contains two cities and twenty-five towns, together with a great number of villages. The capital of the upper province is Ciudad Real, and that of the lower province is Occana. *Ciudad Real* is a regular built town, with some good streets and a square. It contains an hospital, and a manufactory of woollen cloths and flannels. *Occana* consists of three parishes, with a population of 2000. The *Don Quixote* of Cervantes has given celebrity to the province of Lá Mancha.

MANCHE, La, a department of France, bounded on the north and west by the sea; on the south by the departments of Ille and Vilaine; and on the east by those of Orne and Calvados. It produces corn, hemp, flax, and fruits; and mines of copper and iron are wrought to a considerable extent. Glass and serge manufactures are also carried on with advantage. The breed of horses is celebrated in this province, and the forests are very extensive. La Manche contains 528,912 inhabitants.

MANCHESTER, a town in the hundred of Salford and county of Lancashire. See Lancashire.

MANCIPLE, a caterer or clerk of the kitchen. The steward of the Inner Temple was anciently so called.

MANDAMUS, in law, a high prerogative writ, issuing from the court of King's Bench to any individual or corporation requiring what is therein specified.

MANDARINS, the magistrates or governors of provinces in China. See China.

MANDATE, in the canon law, an edict of the pope, by which the person there mentioned obtains the first vacant benefice.

MANDING, a region in the interior of Africa, the government of which is said to be a kind of oligarchy. Various edible roots are produced here, and th enatives are a cheerful and inoffensive race.

MANDRAKE, *Atropa*. See Botany.

MANDREL, a wooden pulley belonging to a turner's lathe, and of which there are different kinds, as the flat mandrel for turning flat boards, and the pin mandrel, which has a long shank adapted to the work to be turned; the hollow mandrel for hollow work, and the screw mandrel for turning screws. See Turning.

MANE of a horse, the proper adjustment of which is of much importance. The mane has by some been cut into the form of an arch or bow, by others it has been notched, and others have very improperly cut it off altogether.

MANEGE or Manage, from the Italian *maneggio*, or Latin *manu agendo*, acting with the hand, denotes the art of riding and managing the great horse, or the covered place set apart for equestrian exercises. The art of horsemanship is chiefly confined to modern times, and seems to have been at first cultivated by the inhabitants of Italy; for it appears that two young men, taught by one Frederick Grison, were procured by Henry VIII. to introduce this art into England, an art in which the great duke of Newcastle, long after this period, became so perfect a master, that he has furnished the best rules for the observation of those who wish to be instructed in this elegant accomplishment. The horse is by nature a docile animal, and, if used with kind and gentle treatment, is in general inclined to obey his master. He ought, however, to be handled at an early age, and his training may commence at three, four, or five years old. Every new lesson ought to be given him with the greatest caution and by the most gentle means; and he ought to be familiarized with the saddle, the girth, and the bridle, without subjecting him to the smallest severity. After being for a short time accustomed to the longe, he ought next to be taught to stand still till mounted, when the rider ought to have it in view to make him move light in hand, and firm and determined in all his motions.

Designs of the manege.—The three natural paces of the horse are the walk, the trot, and the gallop; and the object of the groom is to enable him to perform his work, by the improvement of these paces, with ease, freedom, and activity. To direct the horse accurately in his various motions, sidewise, or straight forward, either at a walk, trot, or gallop, and to sit on his back with firmness, ease, and gracefulness, are the great objects to be attained in the study of this elegant art; and for this purpose, it is obvious that the horse, as well as the rider, must undergo a regular course of previous instruction. In the management of the horse, every change of motion should, as far as possible, be effected in an easy and graceful manner, and by the reins only, and the legs never used except when the hands fail; and it ought always to be considered that it is impossible for the rider to be too firmly settled, or too gentle in his position.

Mounting and attitude.—In mounting, the horse should be approached cautiously by the rider, who ought to take a handful of the mane with his left or bridle hand, putting his left foot gently into the stirrup, raising himself up and passing his right leg clear over the saddle, so as to place himself neatly in his seat. Having thus secured himself in his proper position, his body ought to be erect, easy, and firm, when the horse is in motion, and his legs to hang naturally down without being turned in or out, and only with his toes a little higher than the heels. It is of the utmost consequence that the position of the rider be well balanced, because this must materially affect the horse in all his motions. The best riders always use the rein, but very seldom the legs in the direction or management of the horse, and the rider and horse ought to be so perfectly united as to appear one and the same.

Leaping and swimming.—In teaching the horse to leap, the rider ought to begin with a very low bar, which may be so constructed as when touched to run round, and the horse ought to be accustomed to come quietly up, and after having as it were examined it, to leap coolly over. This may afterwards be repeated in an easy trot, and so accelerated by degrees till he can take the leap at a full gallop. In crossing a river where it may sometimes be necessary for the horse to swim, his head, if possible, ought to be kept against the current, and the utmost caution and gentleness must be used in attempting to turn him.

To stand fire, &c.—In teaching a horse to bear the sound of all kinds of noise, it is best to accustom him to it in the stable when feeding; and this may be done, especially in inuring him to fire-arms, by frequently presenting a pistol, placing it in the manger, and using him to the sound of the lock, then to a flash in the pan, and afterwards by a small charge of powder, so that in this way, by degrees, and by a patient and gentle treatment, he will cease to be frightened at any thing of this nature; and it ought never to be forgotten, that patient, kind, and gentle treatment, is undoubtedly the most proper way of perfecting the instruction of this noble animal.

Feeding.—As the horse, combining strength and activity, must be considered as an animal of great value, it is of no small importance to know what kind of feeding is the best and least expensive. Horses that are used in general for the purpose of agriculture or heavy carriages, are supposed to be fed in a way attended with the least expense, partly on hay and straw, potatoes, turnip, furz, and cabbages, which have all been successfully used as substitutes for oats, and given to the animals cool, together with liquor. See Agriculture and Edinburghshire.

In some parts of England, it appears that horses are frequently kept in a shed, open in front, and furnished with racks, near which there is access to abundance of pure water; and a superstructure of this kind has been considered as more healthy for the horses, and preferable to a stable. For several years this practice has been followed with great success by the Earl of Darlington, and it has been found, by experience, that horses thus treated are not only more healthy than in stables, but at the same time that they are capable of work after they have reached twenty years of age.

Age of the horse.—The most certain criterion of age is that which is derived from the teeth, which are forty in number, and consist of twenty-four grinders or double teeth, four tushes, and twelve fore teeth, from the last of which the age of the horse is to be discovered. These appear when the colt is about twelve days old, being round and not very solid, and are replaced successively by others. When the colt is two years and a half old, he casts the two middle fore teeth in the upper jaw, and also those of the lower, and in one year after he loses four others, one on each side of the former. When he reaches the age of about four years and a half, he drops four others, and always next to those which have already fallen out and been replaced; to these four foal teeth four others succeed, but do not grow so rapidly as the eight first, which are called corner teeth. These replace the four last foal teeth, and constitute the chief marks by which to ascertain the age of a horse, and they are the third both below and above, counted from the middle of the jaw, being hollow in the middle, and having in their cavity a dark or black mark. At the age of four years and a half they are scarcely visible above the gum, but the cavity is very obvious; and they begin to fill in a year and a half, the mark from that time continually diminishing till he reach the age of seven or eight years, when the spots completely disappear, and the cavity is filled up. After this the horse's age can be known only by the tushes or the fore teeth next to those last mentioned, and which like the grinders are not preceded by any other teeth. At three years and a half old the two in the lower jaw generally begin to shoot, those in the upper jaw at four, and, till the animal reaches his sixth year, both of these continue very sharp pointed; when he reaches the age of ten, the gum contracts as he advances in age, and the teeth in the upper jaw appear worn out, long, and blunted, and the more the teeth are exposed, the greater is the horse's age. At the age of about fourteen the gum contracts, and the upper teeth are blunted and are left bare; so that in proportion to the greater or less degree of these marks, as well as by the bars in the animal's mouth, which decrease as he advances in years, his age after that period can only be a matter of conjecture. —Respecting the *Race-horse* and the *Hunter*, see Sports and Pastimes.

See Grison's works, and also those of Pluvinel, Sir William Hope of Kirkliston, the Duke of Newcastel, Rossermini, Earl of Pembroke, Berenger, Thomson, Beyer, Marchand.

MANES, the shade or spirit of the deceased. See Lemures.

MANETHO, an ancient Egyptian historian, who flourished about 304 years before Christ. His celebrated history of Egypt, written in Greek, by request of Ptolemy Philadelphus, is occasionally quoted by Josephus; and indeed the only remains of it are contained in his work against Apion.

MANFREDONIA, a sea-port town of Naples, situated on a bay of the Adriatic of the same name. It contains a population of nearly 6000. Vegetables of all kinds, and fish, are abundant; and some trade is carried on, although not to great extent.

MANGANESE. See Chemistry.

MANGEL-WURZEL, root of scarcity, used chiefly for cattle, and cultivated like turnips, is a species of beet that is unwholesome and destructive to cattle when given in too large quantities at a time.

MANGER, a trough or crib for the reception of grain or corn for horses. It may be made about 20 inches in length and 16 in breadth, and should be so situated as to admit of being conveniently cleaned.

MANGER, of a ship of war, is an apartment athwart the lower deck, the purpose of which is to prevent the water that comes in at the hawse-holes running off, and which is accordingly returned back by the scuppers in the manger.

MANGEEA, or Mangoya, an island in the Pacific ocean, 15 miles in circumference, and situated in 158°, 2′, 45″, west longitude, and 21°, 56′, 45″, south latitude. It was discovered by Captain Cook in 1777.

MANGIFERA, the mango tree, a genus of plants belonging to the Pentandria class. The different species of this tree cultivated in the East Indies are considered excellent.

MANHEIM, a city of Germany, finely situated at the junction of the Neckar and the Rhine, and built with great taste and regularity; contains the palace of the elector, the mint, and custom-house, an observatory, two churches, several convents, and other public buildings; together with an arsenal, and a foundery for cannon. Among the institutions of this city are the academies of sciences, of painting, and of sculpture, a German literary and a meteorological society; likewise a military and a surgical school. The inhabitants amount to 23,000, and, besides the manufactures of tobacco, shawls, cloths, and ribbons, the processes of tanning and of bleaching are extensively conducted. The much celebrated chateau of Schwelzag is situated within a few leagues of Manheim.

MANIA, or MADNESS. See MEDICINE.

MANICHEES, a sect of heretics somewhat similar to the Gnostics, and so denominated from Manicheus. They arose about the year 277.

MANIFESTO, the public edict of a prince concerning any enterprise to be engaged in.

MANILLA, the capital of Luconia. See PHILIPINE ISLANDS.

MANIPULUS, MANIPULE, signifying *a handful*, was a body of men among the Romans, which, in the time of Romulus, consisted of 100, but was afterwards raised to 200. A manipulus, in the Romish church, is an ornament consisting of a small fillet, in form of a stole, and which is worn by the priests, deacons, and subdeacons. In medicine, the term *manipulus* implies a handful of herbs or leaves, and is expressed by the abbreviation *m*.

MANIS, a genus of quadrupeds of the order Bruta. See MAMMALIA.

MANNA, a gentle purgative.—See MATERIA MEDICA. The manna of Scripture was a sweet kind of food like honey, and in the form of coriander seeds, miraculously sent to the Israelites to support them in their journey through the wilderness. Salmasius maintains, that the miracle of Moses consisted not in the production of a new substance, but in the providential supply for the support of the Israelites; and he farther considers this substance to have been that peculiar dew of Arabia which readily condenses, and becomes an article of food, called, by the Arabs, the sugar-plums of the Almighty. But the Jews firmly believe in the miracle, and pronounce their anathema against such as discredit it. Whatever the substance really was, the miraculous interposition of divine Providence in its production is incontestibly evident.

MANŒUVRE is a military term, applicable to the various modes of advantageously conducting an armed force.

MANOMETER, from the Greek, signifying *rare*, and *á measure*, is an instrument for ascertaining the rarity or density of elastic fluids. See PNEUMATICS.

MANOR, a certain extent of land under the occupation of the lord, or proprietor, for the use of his family and dependents, known by the name of the *demesne lands*, or *terræ dominicales*. The other lands belonging to him, as *dominus manerii*, were held and cultivated by his tenants, under certain special services. Whatever portion of the manor remained in an unimproved and uncultivated state, was considered as common pasture, and made use of both by the proprietor and tenants, being known by the designation of the *lord's waste*. Barony or lordship is precisely the same as what was formerly comprehended under the term manor; and the proprietor, or baron was entitled, in consequence of this possession, to hold a court-baron, for determining all disputes, and redressing grievances, among the tenants or occupiers of the land within the demesne. By the English law, the greater barons who possessed extensive territories under the crown, granted to inferior persons smaller manors, to be held of them; and these still continue to be held under a superior lord, called the lord paramount. No manor, however, can exist unless there be tenants that hold of the lord, and unless these tenures shall have been granted so early as the time of Edward the First.

MANSFIELD, a town of Nottinghamshire in England, seated on the river Maun, and consisting of two principal streets; contains a spacious church, an excellent free school, and a charity school for 36 boys, together with several meeting houses, and a theatre. The population of the town and parish, in 1811, was 6,816. The trade in corn and malt is considerable. Some cotton mills, a foundery, several quarries of freestone, and the manufacture of stockings and gloves employ the inhabitants. A weekly market and three annual fairs are held in this place.

MANSION, *Mansio*, a spacious edifice designed as a dwelling-house.

MANSLAUGHTER, in law, is the illegal killing of another suddenly in the heat of passion, without premeditated malice.

MANTEGAR, or MAN-TIGER, the *simia marmon*, or tufted ape. See MAMMALIA.

MANTELETS, in war, are moveable parapets, borne before the pioneers in a siege, to defend them from the musket-shot. They were denominated *vineæ* by the ancients.

MANTIS, a genus of insects belonging to the order *Hemiptera*. See ENTOMOLOGY.

MANTLING. See HERALDRY.

MANTUA, an ancient city of Italy, situated on the river Mincio, is tastefully built and strongly fortified, and the squares and public edifices are very elegant. Among the principal structures may be noticed the Corte, the palaces, the cathedral, the church of St Andrew, the university, and the Imperial academy, which contains a variety of antiquities. The house of Giuglio Romano, the celebrated painter and architect, still remains, and the farm of the poet Virgil was situated in the vicinity of Mantua. This city appears to be even more ancient than Rome, and to have existed in the time of Æneas. It assumed its independence after the decline of the Roman empire; was afterwards ruled by the powerful family of the Gonzagas, but suffered severely by the Austrian invasion, as well as by the war which followed the revolution in France, and was eventually annexed to the Italian republic.

MANUAL, a law-term, denoting where a thing is in actual use or possession, and from which profit arises. Manual labour is that which is is done with the hands. Manual likewise is the title of a service-book of the Romish church.

MANUMISSION signifies the enfranchisement of slaves. The Roman slaves were freed either by the master's consent, when their names were enrolled in the public register, or by the master's testament.

MANURE. See AGRICULTURE.

MANUSCRIPT, commonly denoted by the abbreviation MS. or the plural MSS. signifies a written paper or book, in contradistinction to a printed paper or book. The value of libraries is materially augmented by the acquisition of ancient manuscripts.

MAOUNA, an island in the Pacific ocean, visited by La Perouse in 1787. It was discovered by Bougainville, and is situated in 189° 1′ east longitude, and 14° 22′ south latitude.

MAP. See GEOGRAPHY.

MAPLE, a tree growing in North America, from the saccharine juice of which sugar is prepared. See CHEMISTRY.

MARACAYBO. See CARACCAS.

MARAGNAN, or MARANHAO, a province of Brazil in South America, comprehending an island of 112 miles in circumference. It enjoys a temperate climate, and the soil is productive. The French, who settled in Maragnan in 1612, have been superseded by the Portuguese, who now inhabit it.

MARALDI, JAMES PHILIP, an able astronomer, was born at Perinaldo in the county of Nice, in 1665, and was assisted in his studies by Cassini his uncle. He was employed in 1700 in prolonging the meridian of Paris to the north; and, in 1718, he was associated with other academicians in prolonging the meridian of Paris to the south. He was engaged at Rome by Clement XI. in the correction of the calendar; and his memoirs, contributed to the academy of Sciences, amount to 130. He died in 1729, and in the 65th year of his age.

MARANTA, INDIAN ARROW-ROOT, a genus of plants belonging to the Monandria class.

MARATHON, a village of Attica, remarkable for the signal victory obtained by the Athenians over the Persian army. See GREECE.

MARAVEDI, a Spanish copper coin, equal in value to half a farthing English, or a French denier.

MARBLE. See GEOLOGY, and ARUNDELIAN MARBLES.

MARCELLINUS. See AMMIANUS.

MARCH, the third month of the year, and consisting of thirty-one days. It was the first month of the ancient Roman year; and some ecclesiastical computations are still preserved, from which it appears, that in England the year commenced on the 25th day of March. The vernal equinox is the 20th or 21st of this month, when the sun enters Aries.

MARCHE, an old province of France, bounded on the north by Berry, on the east by Auvergne, on the west by Angoumois, and on the south by Limosin; is about 55 miles in length, and 25 in breadth, and produces corn and wine. Marche now forms part of the department of Creuse, and part of Vienne.

MARCHET, or MARCHETTA, an ancient custom which prevailed in Britain, and by which the tenant, at the marriage of any of his daughters, paid his lord a certain fine. This practice still exists in Caermarthenshire, and some other places.

MARE, EQUUS. See MAMMALIA.

MARENGO, a village of Italy, situated about three miles south-east from Alexandria, and remarkable for a battle fought between the Austrians and French in 1800, by which the latter became masters of Italy.

MAREOTIS, a lake near Alexandria in Egypt, which was surrounded with date-trees and papyrus, but is now almost dried up.

MARGARETA, or PEARL ISLAND, situated in the Caribbean sea, is about 35 leagues in circumference, and abounds in pasture, maize, and fruits, though it is destitute of water, the supplies of which are necessarily brought from the continent. This island consists of two peninsulas, united by an isthmus; and Assumption, the capital, stands in the centre of it. The population amounts to 14,000. Margareta was first discovered by Columbus. The Dutch took possession of it in 1626. It is governed by the captain-general of the Caraccas.

MARGATE, a sea-port town of the county of Kent in England, much frequented as a watering-place, is seated at the north extremity of the isle of Thanet. It has an excellent stone pier, and the harbour is sufficiently fortified. The several streets and squares contain handsome houses, and the public buildings are, the parish church, several chapels, the assembly-rooms, and theatre, and the bathing-rooms. Several libraries are established, and also a charity school for 40 boys and 40 girls. The population in 1811 was 6126.

MARGRAVE, or MARCGRAVE, from the German *marche*, or *marke*, denoting a frontier, is a title of dignity in Germany similar to our Marquis.

MARIAN ISLANDS. See LADRONE ISLANDS.

MARINE BAROMETER, an instrument for ascertaining the pressure of the atmosphere at sea, and which was invented by Dr Hook. See PNEUMATICS.

MARINER'S COMPASS. See MAGNETISM.

MARINES, or MARINE FORCES, a body of troops qualified to fight either in a naval engagement or in an action on shore. See WAR.

MARJORAM, *Origanum*. See BOTANY.

MARITIME, relating to, or bordering on the sea, as a maritime country or kingdom, which is powerful at sea, or which is bounded by the sea.

MARIUS, CAIUS, a Roman general, born of an obscure family at Arpinum, and seven times consul at Rome, conspicuous by his cruelties as well as by his victories.

MARK, St. the Evangelist, was descended of the tribe of Levi. He is supposed to have been a fellow-labourer of Paul, Barnabas, and Peter; and is said to have gone to Egypt after the writing of his gospel, where he founded a church at Alexandria, at which place also he died in the year 68. According to some authors, his remains were carried to Venice; at all events, he is the tutelar saint of that republic, and a church is erected to his memory. See *Eusebii. Eccl. Hist. Lib. II. cap.* 16, *Valesii*, 1659.

Canons of St Mark was a congregation founded at Mantua, by Albert Spinola, about the close of the twelfth century, and which flourished for 400 years.

MARK, a European weight, used more particularly for gold and silver, in which case it is divided into twenty-five carats. Mark is also an ancient coin of England and Scotland; the value of the former is 13s. 4d. and that of the latter one-twelfth of that sum.

MARKET, or Mart, a public place for the disposal of cattle, provisions, or merchandise; and a town privileged with such an advantage is denominated a market town. To every market or fair in England is attached a court for the cognisance of weights and measures, the settling of disputes regarding property, and the punishment of delinquents; and this court is the lowest court of criminal jurisdiction in the kingdom.

MARLBOROUGH, a market town of Wiltshire, seated near the river Kennet, consists of one principal street, with piazzas on one side, and contains two parish churches. The Kennet and Avon canal in the neighbourhood are advantageous to the inhabitants for carrying on trade and public business. Marlborough is governed by a mayor, justices, and aldermen; and the population in 1811 was 2579. The Marlborough statutes were framed by a parliament held here in 1627.

MARLBOROUGH, Duke of. See Churchhill, John.

MARLE. See Agriculture.

MARLINE are tarred coverings, consisting of twisted hemp, and applied to cables and other ropes for their preservation.

MARLOW, a town of Buckinghamshire, situated near the junction of the Thames with the Wycomb, consists of five streets, with some good houses, and contains a church, two free schools, and an almshouse; likewise a bridge crosses the Thames near the town. Some trade is carried on here, and corn and paper-mills, and mills for making thimbles, and for expressing oil from rape and flax-seed, are now established. The royal military college of this place has of late years been removed to Sandhurst in Berkshire. The manor now belongs to Sir William Clayton, Bart. Population in 1811, 2799.

MARMALADE. See Dietetics.

MARMONTEL, John Francis, an eminent French writer, was born at Bort in 1723, and educated at the Jesuits college of Mauriac; after which he studied philosophy at the college of Clermont, and at same time supported himself by his labours as a tutor. An ode of his composition, which had been rejected by the academy of the Floral Games at Toulouse, being happily approved of by Voltaire, Marmontel was stimulated to the full exertion of his poetical talents; and in 1748 his tragedy of *Denis le Tiran* was successfully brought upon the stage, in consequence of which he had the good fortune to be introduced into public notice, and afterwards to obtain the appointment of secretary to the royal buildings at Versailles. Subsequently to this tragedy appeared his *Aristomene, Cleopatra*, and *Les Heraclides.* He was a contributor to the *Encyclopédie*, and also to the *Mercure Francois*, a periodical work; by means of which, through the interest of his friends in power, he enjoyed a pension. In 1758 he removed to Paris, where he was a short time confined in the Bastile, owing to his having thoughtlessly repeated some satirical verses on the Duc d'Aumont. His *Epitre aux Poëtes* procured him the prize of the French academy; he then produced his *Belizarius*; and in 1772 was chosen historiographer of France. He married in 1777, about which period also was published his *Les Incas*; and in 1783 he succeeded D'Alembert as perpetual secretary of the French academy. In his domestic retirement during the turmoil of the revolution in France, Marmontel drew up a memoir of his own life. In 1797 he was chosen representative of the department of Eure; and he died in 1799, in the 77th year of his age. The celebrity of this author rests chiefly on his Moral Tales, Belisarius, and the Incas.

MARMOT. See Mammalia.

MARNE, a department of France, including the old province of Champagne, is bounded on the north by the departments of the Aisne and Ardennes, on the east by the department of the Meuse, on the south by that of the Aube, on the west by those of the Seine and Marne. It affords pasture, grain, and wine.

MARNE, UPPER, a department of France, bounded on the north-west by the department of the Marne, on the north-east by that of the Meuse, on the south and south-west by the Cote d'Or, and on the west by that of the Aube. It is productive of pasture, grain, and wine, and contains iron mines and mineral springs.

MARONITES, a sect of Christians in connection with the Romish church, and which were so called after their first bishop Maro, at the close of the seventh century. They have their patriarchs, archbishops, bishops, &c. and are chiefly resident about Mount Lebanon.

MARPURG, or Marbourg, the capital of Upper Hesse in Germany, situated on the river Lohn, and defended by a castle. It contains a university, with a library, a classical academy, and three Protestant churches. The inhabitants, amounting to 5600, are chiefly employed in the manufacture of serges, camlets, cotton cloth, and chocolate.

MARQUE, or Letters of Marque, granting the subjects of one prince or state authority to make reprisals on those of another, are so called from the German word *marke*, or limit, these letters granting the right to pass the limits of another prince, and to demand and take satisfaction, without the hazard of being condemned as a robber.

MARQUESAS, a group of islands in the Pacific ocean, eight of which are inhabited and four uninhabited. Captain Cook visited them in 1774, and Marchand, a French navigator, in 1789, who likewise discovered what are called the New Marquesas. They have also been occasionally visited by American vessels, and the Russian commander Krusenstern explored them fully in 1803. Of the inhabited islands La Magdalena, or Ohittatooa; St Pedro, or Onateaya; La Dominica, or Oheevahooa, were discovered in 1595 by Alvaro Mendana de Neyra; Hoodi island, or Teeboaa, was discovered by captain Cook; and Trevenneris island, or Ooapoa, Rious island, or Ooahooga, Martin's island, or Nooaheeva, were discovered by Marchand or Ingraham about 1789.

The climate of these islands is favourable, and the productions are the cocoa-palm, the bread-fruit, the walnut, and the plantain tree, the sugar-cane, together with yams, potatoes, &c. The animals are chiefly rats and frogs; birds of various kinds are found in the woods, and fish are very plentiful. The natives are remarkably well made, and of high stature; but the females are less than the men, and have generally an awkward gait. Their chief covering is a small girdle about the loins; but they are profuse in the use of ornament, and their bodies are punctured in a very regular manner. In addition to the girdle, the women wear a large shawl or sheet, which hangs down over the shoulder, and they anoint their hair with cocoa-nut oil. The food of the Marquesans consists of bread-fruit, fish, a paste made of yam, and a kind of pudding called *mahie*, prepared from bread-fruit and taro-root, and they likewise are fond of pork. Their houses are formed of bamboo interwoven with leaves, and those in Santa Christina are elevated on stone platforms. The domestic utensils consist of cocoa-nut shells, calabashes, and large wooden dishes in the form of muscles, and these are generally carved with curious figures. Spears and heavy clubs constitute their weapons of defence, and their canoes are from 20 to 30 feet long, and from 12 to 18 inches broad. The natives are very indolent, and their main occupation consists in war, which is conducted in the most brutal manner, and commonly terminated by the celebration of the dance feast, in which all parties assist. They have little or no government, and distinction consists chiefly in courage, wealth, dependents. Any traces of religion are found chiefly in Martin's island, where some confused ideas of the Divine Being are entertained, together with a reverence for what is considered sacred, and a decided belief in charms. Their language resembles nearly that of the Society isles; but their character, though seemingly generous and humane, has been experienced to be quite the contrary. Their licentiousness is extremely disgusting; and they not only suck the blood of their enemies, as the South-sea islanders do, but even butcher freely their own wives, children, or parents, in times of famine.

The population of the larger of these islands is supposed not to exceed 6000 each; and *Ohittatooa* and *Nooaheeva* are best known to Europeans. The former, named also Santa Christina, is about three leagues in length, seven in circumference, and traversed by a ridge of lofty hills, and one of the bays, called Resolution harbour, is safe and commodious. This island was selected as a missionary station in 1797. *Nooaheeva*, or Martin's island, the principal of the group, is about 17 miles in length, and presents a mountainous and rugged aspect; but the numerous cascades, one of which is 2000 feet in height, have a fine appearance. Several fruitful valleys are observed in different parts, particularly on the west side, where the ground is most level. Other islands are supposed to exist to the north-west and south-east. See Cook's *Second Voyage*; Wilson's *Missionary Voyage*; Marchand's *Voyage*; and Krusenstern and Linanstey's *Voyages round the World.*

MARQUIS. See HERALDRY.

MARRIAGE is a contract between a man and a woman, and may be either civil or religious, by which the parties are bound to live together in mutual love and affection during all the days of their life. It is not peculiar to Christians, but common to all mankind, and of public utility in every government.—Christianity, however, has enjoined the marriage of one man to one woman at a time, as this appears, both from reason and religion, to be most conducive to the interests of civil society. Under the Levitical law, marriage was subject to various regulations. If a brother died leaving a widow without children, it was considered to be the duty of the surviving brother to marry her, and, indeed, she passed at once in this case as the brother-in-law's wife, although commonly acknowledged in presence of two witnesses; but this law was not observed after the Babylonish captivity, there being since that time no distinction of the inheritance of the tribes; but in case of her having had children to his brother this was prohibited, and by the same law a man was forbidden, during the life of his wife, to marry her sister.

Leo of Modena describes the practice of the Jews, in regard to this ceremony, in the following manner: "Three rabbins and two other witnesses, the evening before, choose a place where the ceremony may be performed. The next day, when they come from morning prayers, they all follow the rabbins and witnesses, who, in the appointed place, sit down and order the widow and her brother-in-law to appear before them, who declare that they there present themselves in order to be free. The principal rabbin proposes several questions to the man, and exhorts him to marry the widow; then, seeing him persist in his refusal, after some other interrogatories, the man puts on one of the rabbin's shoes, which is fit for any foot, and the woman, in the mean time, draws near to him, and, assisted by the rabbin, says to him in Hebrew, 'My husband's brother will not continue the posterity of his brother in Israel, and refuses to marry me, as being my brother-in-law.' The brother-in-law answers, 'I have no mind to take her.' Hereupon the woman stoops down, loosens and pulls off the shoe, throws it upon the ground, spits upon him, and says in Hebrew to him, with the help of the rabbin, 'So shall it be done unto that man who will not build up his brother's house; and his name shall be called in Israel, the house of him that hath his shoe loosed.' These words she repeats three times, and they who are present answer as often, 'he that hath his shoe loosed.' Hereupon the rabbin immediately tells her, that she may marry again; and if she requires any certificate of what is done, the rabbins shall deliver one to her."

In early ages, some nations appear to have lived altogether without the observance of the marriage institution. Among the Greeks, we are told that Cecrops, king of Athens, was the first who introduced it among the inhabitants of Greece. After the Grecian commonwealth became permanent and regular, the institution of marriage was considered highly honourable, and was greatly encouraged. The severity of the Lacedemonians towards those who lived in a state of celibacy, or who delayed entering into the conjugal state beyond a certain period of life, is well known; and the Athenians, by an express legislative enactment, required that every individual, who should be entrusted with the management of public affairs, should have previously entered into the marriage state.

The age at which parties may contract marriage varies in different countries and among different nations. By the laws of Lycurgus, the Spartans were not permitted to marry till such time as they had attained their full strength and arrived at maturity, in order that their offspring might be possessed of all the qualities of a healthy and vigorous race; and they preferred the winter season, and chiefly the month of January, as the period most suitable for celebrating their marriage festivals. Among the Romans, again, after the ides of June was accounted the most lucky season; and in both these nations polygamy was expressly prohibited.

In almost every nation there is something peculiar respecting the marriage ceremony. Among rude and savage tribes, the husband makes a purchase of his wife, either from the father or his relations to whose custody she may have been entrusted. But in the state of civilized society, in which the refined manners and education of the female render her fit for becoming the friend and companion of the husband, this practice never takes place. A very strange custom, however, still prevails in Germany, by which those of the highest rank, contracting a marriage with a woman of inferior station, gives her only his left hand; and this kind of marriage they term *morganatic*. In a contract of this kind, it is necessarily understood that the wife continues in her former inferior station, and that the offspring shall, in all matters of inheritance, be bastardized and rendered incapable either of succession or of bearing the name or arms of the family, although the children are nevertheless considered legitimate in other respects. This privilege, however, is only permitted to princes and persons of the highest rank.

By the law of England, marriage is looked upon as a civil contract; and the preservation of the purity of this state is entirely guarded by the ecclesiastical law, which has power to prohibit, annul, or punish all marriages entered into contrary to the sacred code of the law of Moses. Under the ancient law, it was directed that the concurrence of the parents should be obtained to the marriage of a child under age; but this is now absolutely necessary, and without it the contract is void. According to the English law, therefore, a valid marriage requires not only the consent of the parties, but that they be free from canonical impediments, such as pre-contract, consanguinity, and the like, such disabilities rendering the marriage voidable, or liable to be dissolved by the ecclesiastical court, although to all civil purposes they are valid till such separation has actually taken place. In the case of a mutual promise of marriage between parties, if either of them refuse to fulfil the engagement, damages may be sued for and recovered; and although no period may have been agreed upon to fulfil the engagement, yet, if the plaintiff declares that he offered to marry the defendant, who absolutely refused, in this case damages may be sued for; but unless the engagement is in writing, and signed by the party, no action can be maintained. In marriage it is also required that the parties be free from civil impediments of prior marriage, want of age, and non-consent of parents or guardians, when required; and, by the statutes of William and Anne, a clergyman is liable to a heavy penalty who shall marry a party without publication of banns, or without a licence, which requires the consent of parents or guardians to be sworn to before it can be obtained; and whosoever shall marry any woman under sixteen years of age, without consent of parents or guardians, shall be liable to fine or imprisonment for five years, and her estate shall, moreover, be enjoyed by her next heir during her husband's life. And by the act of 26 Geo. II. it is declared, that where either party is under twenty-one years, not being a widow or widower, without the consent of the father, or, in case of his being dead, of the mother and guardians, it shall be null and void. Want of reason is another disability, as by 15 Geo. II. it is enacted, that the marriage of lunatics and persons under frenzies, if declared lunatics under a commission, or if under the care of trustees, shall be likewise entirely void; and, farther, the marriage must be celebrated by a clergyman in due time and form.

Marriage may be dissolved by death, or by divorce in the spiritual court; not *a mensa et thoro* only, but *a vinculo matrimonii*, for canonical cause existing previous to the contract, or it may be dissolved by act of parliament, as for adultery. So long, however, as the parties are united in marriage, the husband and wife become one person in law, which unity is the principal foundation of their respective rights, duties, and disabilities. To render marriage valid by the law of England, it must be preceded by publication of banns, or by licence from the spiritual judge, and must be celebrated in some parish church or public chapel, unless a dispensation be obtained from the archbishop of Canterbury. Previous to the first publication of banns, it is necessary that the parties to be married shall deliver to the parson, vicar, &c. a notice in writing of their real names, of the house or houses in which they reside, and of the time they have dwelt there, seven days before the publication; and previous to the solemnization of marriage, the banns shall be asked upon three several Sundays in presence of the congregation, and if, during that time, any objection shall be offered, such publication of banns shall be rendered void; and, except in the case of a special licence, it is required that the marriage be solemnized in that church or chapel where the license is granted, and within which parish one of the parties must have resided for four weeks immediately previous to his having obtained such licence. The same statute likewise enacts, that there shall be two credible witnesses at least present during the solemnization of the marriage, besides the minister, who shall attest it; and every marriage is also required to be entered in the parish register; and, should both or either of the parties be under age, also attesting that it is with the consent of the parents or guardians, as well as by the parties themselves, and attested by two credible witnesses.

By the law of Scotland, marriage requires the consent of the parties, and, if regular, the proclamation of banns; but it becomes valid without proclamation by the consent of the parties themselves before a magistrate, or simply before witnesses, or even without formal consent, if the parties live together at bed and board, and be generally reputed husband and wife, or address each other as such; and children may enter into marriage without the knowledge of the father, and even in opposition to his remonstrances. Consent, however, is not valid within the years of pupilarity, which is the age of fourteen in males, and twelve in females; but if, after that period, they cohabit, their marriage is fully perfected. Marriage may also become valid by consent without consummation, if the consent be *de præsenti;* but a promise of marriage, *stipulatio sponsalitia,* may be resiled from so long as matters are entire, although the party resiling is liable in damages; but a *copula* subsequent to promise, renders it valid. In the case of divorce upon adultery, the guilty parties are specially prohibited from marrying by the law of Scotland, statute 1600, cap. 20. See ADULTERY and DIVORCE.

MARRIAGE-SETTLEMENT is a legal deed antecedent to marriage, by which a jointure is secured to the wife after the husband's death.

MARROW, the oleaginous substance contained in the cavity of the bones. See ANATOMY.

MARRUBIUM, WHITE HOREHOUND, a genus of plants belonging to the Didynamia class.

MARS, one of the primary planets. See ASTRONOMY.

MARS, in heathen mythology, the god of war, was the son of Jupiter and Juno, or, according to some authors, of Juno merely, who conceived by touching a flower shewn her by Flora. The cock, dog, and wolf were sacred to him.

MARSEILLES, the most ancient city of France, and capital of the department of the Bouches du Rhone, is situated near the Mediterranean, and consists of the Old and the New Town. The former is built on the declivity of a hill, and occupied chiefly by fishermen and the humbler classes; but the New Town is spacious and elegant. The finest streets are Beauvau and La Cainbiere; and the principal squares are the Place Castelane, the Place St Ferreol, the Place de la Comedie, and the Place de Montiers. The most remarkable public edifices are the exchange, the ancient cathedral, the arsenal, the theatre, and the church of St Victor; likewise the cidevant chartreuse, the lazaretto, and the strong castle of If, situated on an islet, may be considered as objects worthy of notice. Marseilles contains three extensive hospitals, and several literary and scientific institutions. The convent of the Bernardines is now devoted to the museum, lyceum, school of design, public library, &c. This city, in respect to commercial intercourse, has been named Europe in miniature. It has a very superior harbour with convenient quays, and is defended by a fort. The population is estimated at 96,413.

MARSH. See *Draining* under AGRICULTURE.

MARSHAL, or MARESCHAL, was originally the appellation of an officer who had the care of horses; but it is now applied to officers of different employments, as earl-marshal, knight-marshal, or marshal of the king's house. The earl-marshal is an officer of state, who takes cognisance of whatever relates to honour and arms, and determines matters respecting war, within the realm, which cannot be determined by common law. This office was made hereditary in the family of Howard in 1672, and still continues. The knight-marshal is one who executes the decrees of the lord-steward, and who has six marshal's men under him, who are king's bailiffs. The marshal of the King's Bench has custody of the King's Bench in Southwark; the power of investing whom is in the crown.

The Marshal of France, under the old government, was the highest dignity in the French army, and continued for life. These marshals were succeeded by the Marshals-de-camp, who do the same duties, though they do not possess the same authority.

MARSHALLING. See HERALDRY.

MARSHALSEA, a court of record, originally established for the administration of justice between the king's domestic servants, and holden before the steward and marshal of the king's house. The *Curia Palatii,* or Palace Court, instituted in the reign of Charles I., is an improvement upon the ancient court. It is held once a week before the steward of the household and knight-marshal, and the steward of the court or his deputy, and it decides on all manner of personal actions arising between parties within twelve miles of the palace of Whitehall. A writ of error lies from this to the court of King's Bench.

MARSHFIELD, a market-town of Gloucestershire, consisting of one street. It is governed by a bailiff, has a population of 1300, and carries on some trade in malt.

MARSHMALLOW, *Althea,* a genus of plants of the Monadelphia class.

MARSYAS, in heathen mythology, a great musician of Celænæ, who having overcome Apollo at a trial of skill in music, was flayed alive by him. His death was lamented by the fawns, satyrs, and dryads, from whose overflowing tears arose the river which is known by his name in Phrygia. This unfortunate musician is represented as tied with his hands behind his back, while Apollo stands before him with his lyre.

MARTIAL LAW, the law of war, depending necessarily on the arbitrary power of the prince or his delegates. But this, according to Chief-Justice Hale, is in reality not a law, but something indulged rather than allowed as a law.

MARTIAL, MARCUS VALERIUS, an eminent Latin poet of the first century, was a native of Arragon in Spain, where also he was educated. In his twenty-first year he went to Rome, and his poetical talents obtained him the highest patronage. After a residence of thirty-four years at Rome, he returned to his native place, where he married, and lived comfortably for the remainder of his life. Fourteen books of Martial's epigrams are extant, and his writings are valued for their frequent allusion to Roman customs and manners. The best editions of his works are the Delphin and Variorum.

MARTIN, ST. was born at Sabaria in Pannonia, now called Hungary, about the commencement of the fourth century. He was at first occupied in a military capacity, but resigning it for the ecclesiastical profession, he became a zealous advocate for Christianity; and, in 374, he was appointed bishop of Tours. Marmountier, which is the oldest abbey in France, was built by him. After having powerfully diffused his doctrines among the heathen, he died at Candes about the year 397.

MARTIN. See MAMMALIA and ORNITHOLOGY.

MARTINGALE, in the manege, a leathern thong fastened to one end of the girths under a horse's belly, and at the other end to the muss-roll to prevent him rearing.

MARTINIQUE, one of the Caribbee islands. See AMERICA.

MARTLETS. See HERALDRY.

MARTYR, one who endures death for the sake of religion. Those who perished in the holy wars, or were banished for religion in ancient times, were denominated martyrs; but the term is applied particularly to the primitive Christians who suffered for the gospel. The festivals of the martyrs are of as ancient date as the time of Polycarp, who suffered martyrdom in the year 168. They consisted of prayers, thanksgivings, and orations made at the graves of the martyrs, together with almsgiving and the celebration of the eucharist.

MARTYR, JUSTIN, a Christian father, was born in Flavia Neapolis, a city of Samaria, and is supposed to have been converted to Christianity about the year 133. In 140, he presented his first apology to the emperor Antonius at Rome. After this he went to Asia, and on his return addressed his second apology to Marcus Antoninus the philosopher; and he suffered martyrdom about the year 164.

MARTYR, PETER, a celebrated reformer, was born at Florence, in 1500 and died in 1562.—He prosecuted his studies at Padua and Bononia, and became one of the first preachers in Italy. On perusing the works of Luther, Zuingle, and Bucer, he was led to embrace the Protestant doctrines, to which likewise he gained over many converts. In 1542 he was called to the theological chair of Strasburg, in which he continued eminently useful for a period of five years. He married in 1546, and three years afterwards he was appointed to the professorship of divinity at Oxford. Returning to Strasburg, he was present at the conference of Poissy. His works are numerous, and his ideas of the eucharist correspond with those of Calvin.

MARTYROLOGY, from the Greek, signifying *witness* and *discourse*, is an account of the lives and sufferings of martyrs. That of Eusebius was chiefly respected in the ancient church, but is no more extant. Of the various works of this kind that have appeared, few of them are to be depended upon. The Protestant martyrologies are chiefly those of Fox, Clark, and Bray.

MARY, Queen of England, and daughter of Henry VIII. by Catherine of Arragon, was born 1517; a person of a liberal education, but much influenced in her conduct by bigotry and cruelty, which she displayed in a violent persecution of the Protestants. In 1554 she married Philip of Spain, eldest son of Charles V., with whom she lived unhappily. With her death, in 1558, ended the papal dominion in England.

MARY STEWART, daughter of King James V. king of Scotland, by Maria of Lorraine, was born 1542, and by the death of her father became heiress to the throne when she was only eight days old. Henry VIII. of England projected a marriage between his son Edward and the infant queen; but his offer being rejected, he sent troops to Scotland and plundered Edinburgh. Mary being sent to France, was betrothed to the dauphin Francis in 1548; and at that court she contracted all the prejudices that occasioned her future misfortunes, and acquired all the accomplishments which afterwards contributed to render her an object of universal admiration. The marriage was celebrated in 1558; and in compliance with the wishes of their father-in-law, she and her husband, on the supposition of the illegitimacy of Elizabeth, assumed the title of king and queen of England, a circumstance which excited the enmity of Elizabeth, and afterwards proved so fatal to Mary. In the following year Henry II. of France died, and Francis became king; but in less than two years Mary became a widow, and returned to her paternal kingdom. At this unhappy period Scotland was torn by intestine divisions, and had become a prey to the zeal of fanatics; and such was the spirit of the times, and the violence of the Presbyterian party, that, in their hatred of Popery, they spared neither abbeys nor cathedrals, nor libraries, nor monasteries, nor even the monuments of the dead. Venerating the religion in which she had been educated, on the first Sunday after her arrival in her native kingdom, she ordered the celebration of mass in her own chapel of Holyrood; but her subjects were unwilling to allow to their sovereign that liberty of conscience which they claimed to themselves, and the mob, in their furious zeal for presbytery, proceeded to insult her. From this hour may be dated those troubles and misfortunes which followed her to the brink of the grave, when she was beheaded in the castle of Fotheringay, February 1587, after offering her earnest prayers that God might forgive all who had thirsted for her blood. Thus ended the unhappy life of the beautiful and accomplished Mary queen of Scots. After being disinterred from the cathedral of Peterborough, her remains were finally deposited by her son in Westminster abbey. See the article BRITAIN; also Whitaker, Robertson, and other writers.

MARY II. queen of Great Britain, and eldest daughter of James II., born 1662, was educated in the Protestant faith, and married William III. of Nassau, then prince of Orange, and afterwards king of England, with whom she shared all the rights belonging to the crown. This most accomplished, amiable, and excellent queen died of the small-pox, 1694, aged 33.

MARYGOLD, *Calendula*. See BOTANY.

MARYLAND, one of the United States of America. See AMERICA.

MARYPORT, a market-town of Cumberlandshire, in England, is divided into two parts by the river Elden, and is regularly built. The population, in 1811, was 3000. A cotton manufactory is established here, and some considerable trade is carried on.

MASCULINE, in grammar, applies to the male. It is likewise applied to substantives which have no gender; but this varies according to the language, or the words introduced from one language to another; thus trees are masculine in French, and in the Latin they are feminine. The astrologers distinguished the planets by masculine and feminine, according to their supposed qualities.

MASH is a drink given to horses, and is made by pouring a proper quantity of boiling water upon half a peck of ground malt, which is then properly stirred. This drink is given after hard work, during great sickness, or after a purgative.

MASK, or MASQUE, an ancient invention for the covering of the face, formed with apertures for the mouth and eyes. The invention of theatrical masks, which were common among the Greeks and Romans, is ascribed to Eschylus by Horace; but, according to Aristotle, the inventor and time of invention are alike unknown. Modern masks were introduced about the close of the sixteenth century.

MASKELYNE, NEVIL, D.D. a remarkable astronomer, was born in London in 1732, and educated at Westminster school, after which he prosecuted his studies at Cambridge. The occurrence of the solar eclipse of 1748 had biassed his mind to the study of astronomy; and when he entered upon the curacy of Barnet, in 1755, he found leisure to devote himself to his favourite pursuit, and even prepared some calculations for the celebrated astronomer Dr Bradley. Having become a member of the Royal society in 1759, Dr Maskelyne was, in 1761, sent to St Helena, for the purpose of observing the transit of Venus over the sun's disc; and during a residence of ten months on that island, he was employed in useful observations. On his return, he published "The British Mariner's Guide;" and in 1763, he, in a voyage to Barbadoes, made trial of Harrison's new time-keeper, and Irvin's marine-chair. In 1764, he succeeded to the appointment of astronomer-royal, in which he continued for the long period of 46 years. At his suggestion, the board of Longitude commenced a nautical almanack in 1767, which has been advantageously continued. He likewise presented to the Royal society, in 1774, a paper containing observations taken at Schehalien, in Perthshire, with the view of ascertaining the mean density of the earth; and for this he was rewarded with the Copley medal. Dr Maskelyne was honoured with great church preferment; he married when rather advanced in life, and died in the 79th year of his age. The first volume of his observations appeared in 1774, and since that period other three volumes have been published. He contributed no less than 28 memoirs to the *Phil. Trans.* between the years 1760 and 1794; and, in the midst of his manifold avocations, he corresponded with all the eminent astronomers of Europe.

MASON, WILLIAM, an English poet and divine, born in 1725, and died in 1797. Having taken his first degrees at St John's college, Cambridge, he removed to Pembroke college, of which he became a fellow in 1747, and was afterwards promoted to the rectory of Aston in Yorkshire, as well as to the appointment of chaplain to his Majesty. His first poetical attempt was an ode on the installation of the duke of Newcastle as chancellor of the university of Cambridge; and this was successively followed by a monody to the memory of Pope, and by his Elfrida and Caractacus, two dramatic poems. These were all well received, together with a collection of odes in imitation of Gray, and a collection of elegies; and his first volume of poems was published in 1764, in 8vo. The English Garden, a didactic poem, was published in 1781; this was followed by an ode to the naval officers of Great Britain, and one to Mr Pitt; and in 1783 appeared his translation of Fresnoy's Latin poem on Painting, with annotations, &c. Being honoured with the preferments of precentor and canon-residentiary of the cathedral of York, he, in 1788, preached an occasional discourse on the subject of the slave trade. In this year also he wrote the secular ode; the essays on English church music appeared in 1795; and in 1797 was published a second volume of his poems. Mr Mason was chiefly eminent as a lyric poet, in which he was a confessed imitator of Gray, whose poems he published with memoirs in 1775.

MASONRY. See ARCHITECTURE.

MASONRY, FREE, an ancient institution, comprising persons of all ranks and countries, and in which the members recognize each other by certain rites, signs, and words. Respecting its origin, various opinions are entertained; but it undoubtedly bears some affinity to the Eleusinian and Dionysian mysteries, as well as to the institutions of the Essenes, the Kasideans, and the Pythagoreans. The Dionysian artificers were incorporated by the kings of Pergamus, had the privilege of building temples and theatres, and were subdivided into lodges.

Free-masonry was, in modern times, first confined to an itinerant society of Italian, French, Greek, German, and Flemish artists, who were employed in the erection of churches and the like, and introduced themselves into Kilwinning in Scotland, and into York in England, at a very early period. An act was passed by the English parliament, in 1425, prejudicial to free-masonry; but the institution seems, notwithstanding, to have flourished, for a lodge was not only patronized at Canterbury by the archbishop, but even Henry VI. himself became a mason, and drew up a manuscript on the subject, which has been transmitted from the Bodleian library to the earl of Pembroke. Masonry was likewise favoured in Scotland by James I.; and, in the reign of James

II., the dignity of Grand-master was conferred on William St Clair, earl of Orkney and Caithness, in whose family it became hereditary. Different lodges, then established in the kingdom, held their charters of erection from the Kilwinning lodge. Two charters granted by the Scottish free-masons, to the St Clairs of Roslin, are contained in Hay's M.S. in the Advocate's library. They respect the nomination of office-bearers, and were resigned to the Scottish lodges in 1756, after which the Grand-lodge of Scotland was established. The Grand-lodge of England was instituted in 1717, and that of Ireland in 1730. About this time, also, masonry was introduced into the East Indies; and it has since extended almost over all the countries in the world. Those who desire further information on this subject are referred to a *History of Free-masonry*, published at Edinburgh, in 1804, by Alexander Lawrie.

MASORA, among the Jews, denotes a work on the Bible, executed by learned rabbins. In this work, which is considered the hedge or fence of the law, the true reading of the Hebrew text is marked by vowels and accents, and the chapters, sections, verses, and words are accurately numbered. Any irregularities in the letters are also particularly noticed.

MASQUERADE, from the Italian *mascarata*, signifying raillery, is an assemblage of masqued persons, met for the purpose of dancing and other diversion. This entertainment has been long practised abroad, and is now not uncommon in Britain.

MASS, Missa, in the Romish church, the office or prayers at the celebration of the eucharist; of which every minutia is supposed expressly to allude to the particular circumstances of the passion and death of our Saviour. Masses are divided into high and low. High mass is sung by choristers, when a deacon and subdeacon assist in it; but in low mass the prayers are merely rehearsed. Ordinary mass is that said for the dead; and other masses are variously denominated.

MASSACHUSETS, Proper, one of the United States of America, situated between 79° 50′ and 73° 10′ west longitude, and between 41° 13′ and 42° 52′ north latitude; is about 190 miles in length, and 90 miles in breadth, and contains an area of 6250 square miles. It consists of fourteen counties, Berkshire, Hampshire, Franklin, Hampden, Worcester, Middlesex, Essex, Suffolk, Norfolk, Plymouth, Bristol, Barnstable, Dukes, and Nantucket.

The western part of Massachusets is mountainous; but the soil of the northern, middle, and western tracks is favourable to the production of Indian corn, wheat, barley, oats, hemp, flax, hops, potatoes, and various fruits. Of the mineralogical produce, iron, copper, and lead ores, black-lead, together with pyrites, limestone, marble, and red ochre, are common in different parts. Several mineral springs are discovered. The Connecticut and Merrimack are the principal rivers; besides which, the Charles and Ipswich are navigable to some extent. The Middlesex, Montague, Hadley, and Essex canals are likewise of great advantage to trade. The manufactures of this state are chiefly cotton and woollen goods, straw bonnets, articles of hardware, and cordage. The commercial intercourse is remarkably extensive, and occupies upwards of a third part of the shipping belonging to the United States. Massachusets contains two colleges, one of which has a library of 17,000 volumes; it likewise contains two academies, and various literary and charitable institutions. The towns are twenty-nine in number; and Boston, which is the principal, has already been described. See Warden's *Account of the United States*.

MASSILLON, Jean Baptiste, an eminent French preacher, born at Hieres, in Provence, in 1663. In his seventeenth year he entered the congregation of the oratory; and in consequence of his very superior talents and great eloquence, he soon became extremely popular. When he preached before Louis XIV. in 1669, the monarch thought highly of him; and in the second sermon he delivered before Louis, in 1704, he was still more successful. The bishopric of Clermont was conferred upon him in 1717; in the following year he prepared his well known discourses, entitled, *Petit Carem*; and, in 1719, became a member of the French academy. He died in 1742.

Massillon was equally admired for his unrivalled talents and for his exemplary character. As a preacher he was peculiarly impressive in his manner and style of eloquence; and though by no means insensible of the high estimation in which he was held, he uniformly maintained the most unaffected humility. His works were published at Paris, in 1745, in 14 vols. 12mo; and a collection of his most striking passages was likewise published in 1748, in one volume 12mo.

MASSUAH, an island situated near the coast of Abyssinia. It has an excellent harbour, and carries on some trade, though its commercial importance has considerably declined. The imports consist chiefly of cloths of different kinds; and gold, ivory, and corn are exported. This island is destitute of water, and provisions are very scarce. The houses are constructed of poles and bent-grass, but some few are of stone, and built two stories high. Glass beads of any kind pass for money, and the coin is valued by the Venetian sequin. Massuah became subject to the Turks in the time of the emperor Selim. It is governed by the chief of a Mahometan tribe inhabiting the coasts of the Red sea.

MAST. See Ship-building.

MASTER, a title of authority, as the Grand-master of Malta, of the Golden-Fleece, of the Free-masons, &c. *Master of Arts* is the first degree of the foreign and most of the Scottish universities, and the second in Oxford and Cambridge. *Masters in Chancery* are assistants to the lord chancellor and master of the rolls, and are divided into ordinary and extraordinary. *Master of the Horse* is an officer entrusted with whatever relates to the king's stables, races, breed of horses, &c. *Master of the Ordnance* is one who commands the king's ordnance and artillery. *Master of the Rolls* is an assistant of the lord chancellor of England. *Master of the Ceremonies* is an officer appointed for the more solemn reception of ambassadors and others at court. And the *Master of a King's ship* navigates the vessel under his superior officers, and takes cognizance of the rigging, stores, &c.

Mastich | Match.

MASTICH, a resinous gum obtained from the *pistachia lentiscus*. See CHEMISTRY.

MASTIFF, a species of dog. See MAMMALIA.

MATCH, a kind of loosely twisted rope, composed of hemp, and prepared to retain fire. It is of essential use in military affairs.

Mate.

MATE, in naval affairs, is one who shares the duties of the master at sea, and commands in his absence.

MATERIA MEDICA.

Introduction

THE remedies employed, to remove or relieve disease, constitute the MATERIA MEDICA, or Materials of Medicine. They consist of substances derived from all the kingdoms of nature; of certain mechanical or physical actions or applications; and of certain powers or influences which affect the mind or excite the passions; though the remedies of this last head are seldom included in a treatise on Materia Medica. The natural substances employed as remedies are divided into simples and compounds; the former being either products of the animal, vegetable, and mineral kingdoms, which are properly entitled to the epithet simple, or such chemical preparations as are manufactured rather by the trading than the medical chemist, while the latter consist of the preparations denominated officinal, as they are made by the apothecary or the medical chemist. The second head comprehends chiefly heat, cold, electricity, galvanism, exercise, and friction.

An account of the Materia Medica comprehends the natural, commercial, and medical history of the simples; a description of the compounds and the modes of preparing them; and the use of remedies in general in the cure of disease. The first division may be denominated PHARMACOLOGY; the second, PHARMACY; and the third, THERAPEUTICS. These terms will form the titles of the three following chapters. The history of the progressive improvements made in this department will be included in the general history of Medicine.

Some writers on the Materia Medica have treated of *aliments* as a class or division of remedies; but as they have been already considered in this work, under DIETETICS, no farther notice will be taken of them here.

In the following brief treatise on the Materia Medica, the simple articles received by the several medical colleges of the United British empire, will be enumerated under their respective natural classes, but only such simples will be particularized as are most commonly used in medicine. The reader who wishes for a complete view of the subject, may consult the following works: Lewis's Experimental History of the *Materia Medica*, by Aikin; Cullen's *Materia Medica*, second edition; Pearson's *Synopsis of the Materia Medica*; the *Thesausus Medicaminum* of the same author; Murray's Elements of *Materia Medica* and *Pharmacy*; Duncan's Edinburgh New Dispensatory; and Kirby's Tables of the *Materia Medica*, with appropriate *Formulæ*.

CHAP. I. PHARMACOLOGY.

Pharmacology.

The natural bodies admitted as remedies into the catalogue of the Materia Medica, published by the London, Edinburgh, and Dublin colleges, amount to about 282; namely, 22 from the animal, 220 from the vegetable, and 40 from the mineral kingdom. In the account here to be given of these substances, they will be arranged according to the most approved systems of modern naturalists; and of such as are particularly mentioned will be given a short description, where necessary, of each article, its native country, the part used in medicine, the form in which it is commonly employed, its general medical properties or effects, its average dose for an adult, and, in some instances, the particular cases or diseases to which the article is suited.

SECT. 1. *Remedies from the Animal Kingdom.*

Of the remedies drawn from the animal kingdom, seven are derived from the class of MAMMIFEROUS animals, namely, phosphorus, muriate of ammonia, castor, musk, hartshorn, mutton suet, and hog's lard; one from the cetaceous class, spermaceti; two from birds, goose grease and eggs; one from fishes, isinglass; one from the testaceous mollusca, oyster shells; three from the crustacea, crab's eyes and claws, and millipedes; one from the annelides, the leech; four from insects, cantharides, cochineal, honey, and wax; and two from zoophytes, red coral and sponge.

Phosphorus.—This inflammable substance is an animal product, procured generally by decomposing the phosphoric, acid derived from bones. It appears in the form of slender sticks, of a yellowish colour, and semi-transparent. It has not yet been brought into general use; but, when dissolved in olive oil, forms an excellent external stimulant in cases of chronic rheumatism and palsy. See Kirby's Tables, under *Stimulants*.

Muriate of Ammonia.—The *sal ammoniac* of commerce is a white, compact, tough, heavy, saline mass, in the form of a thick cake, prepared from various animal substances by the chemical manufacturer. It is employed, dissolved in water, as a cooling lotion or as a stimulant, according to the strength, in external inflammations, contusions, and sprains, and is sometimes given internally in low fevers; but its principal use is to form the various officinal preparations of ammonia.

Castor is a peculiar secretion formed below the tail of the beaver. It is contained in a membranous bag, is of a tenacious consistence, a dark brown colour, with a pungent bitter taste, and a strong unpleasant odour. It is imported both from Russia and Canada, but the Russian castor is esteemed the best. It is used as an antispasmodic sometimes in substance, in a bolus in the dose of about 20 grains, but more commonly in the form of tincture, chiefly in hysteric affections.

Musk is an animal secretion, found in a bag near the navel of the Thibetian musk animal. In the shops it appears in the form of a coarse powder, of a dark brown colour with a tinge of red, an acrid taste, and a very strong penetrating odour, which in a small degree is regarded by many persons as an agreeable perfume, but from a large quantity becomes an overpowering stench. Musk is brought from the East Indies, and is sold at a very high price; when genuine, it is a most valuable medicine, as a stimulant, in the advanced stage of typhus fever, and as an antispasmodic in hooping cough, tetanus, and epilepsy. It is best given in substance, in the form of bolus, or mixture, or by way of clyster. Dose in the two former, 10 to 20 grains.

Hartshorn, or the substance of stag's horns, is now seldom employed, except when burned, when it forms the purest phosphate of lime, useful in rickets, or where there appears to be a deficiency of bony matter in the system.

Mutton suet, and *hog's lard*, are largely employed in preparing ointments, and ecerates for dressing wounds and ulcers; and the former is often given with advantage, boiled with milk or broth, in violent purgings.

The fatty matter, absurdly called *spermaceti*, is a concrete animal oil, derived from the head of the great spermaceti whale, *Physeter macrocephalus.* It is so friable that it may be easily rubbed to powder, and melts with a gentle heat. It is given internally mixed with syrup, or made into an emulsion, in coughs, but is not now considered "the sovereign'st thing on earth for inward wounds." It is principally employed in the composition of ointments and cerates.

Eggs are but little used in medicine. The yolk is sometimes used for assisting in forming an emulsion from spermaceti or castor-oil, and the white for preparing a curd with alum for inflamed eyes, and the shells are ground into a powder which is occasionally given in heartburn.

Isinglass, a modification of gelatine, procured from the skin of several species of sturgeon; is used as an emollient in the forms of soup and jelly, and is supposed to be the principal ingredient used in making court-plaster.

Oyster shells, crab's eyes, and *crab's claws*, rank under the same head, and are employed, when levigated into a very fine powder, as remedies against acidities in the stomach and bowels.

Millepedes are scarcely employed in modern practice.

Leeches.—The *Hirudo medicinalis*, procured from the British lakes, or imported from Sweden, is the chief instrument in the hands of the surgeon in topical bleeding, in all cases where cupping is inconvenient. The history of this remedy, and the mode of applying it, have already been sufficiently detailed under HELMINTHOLOGY.

Cantharides, or Spanish flies, the *Lytta vesicatoria*, when dried and reduced to powder, form the essential ingredient in plasters and ointments for blisters and issues. They are brought from the south of Europe, and, when good, are of a lively green and brilliant brown colour, when entire; and in the state of powder, are brown, with shining specks, and have a very strong odour. They are spoiled by too much heat. Theyare employed in the form of tincture, as a stimulant, both externally and internally, but in the latter very great caution is required.

Cochineal, the dried bodies of the *Coccus cacti*, is seldom used in medicine, except as a colouring matter for powders and tinctures. It has indeed been much, but undeservedly, extolled as a specific in hooping cough.

Honey is now but little used in medicine, except for gargles; and the Edinburgh college has very properly substituted sugar in its stead. *Bees-wax* is employed chiefly in the preparation of ointments, cerates, and plasters.

Red coral, when reduced to a fine powder, is given as an antacid in cases of heartburn, and is sometimes used as an ingredient in tooth-powder.

Sponge is employed chiefly by the surgeon in forming tents for stopping hemorrhages, and dilating wounds and ulcers. When burned to charcoal, it is used as a remedy, though of doubtful efficacy, in scrophula.

SECT. II. *Remedies derived from the Vegetable Kingdom.*

Before enumerating the vegetable remedies, according to their systematic order in botanical classification, it is necessary to notice a few vegetable products, which are derived from different or uncertain plants; such as charcoal, wood soot, alcohol, vinegar, sub-carbonate of potash, ammoniacum, myrrh, sagapenum, and colomba.

Charcoal, when fresh burned, and powdered, is a useful antiseptic, or corrector of putrid odours. It forms an excellent tooth-powder, and is given internally in diarrhœa and dysentery.

Alcohol.—Ardent spirit, distilled from various vegetable substances, chiefly from malted grain, sugar, or molasses, under the denominations of whisky, gin, and spirit of wine, or from wine, under the name of brandy; is employed for several purposes in medicine, especially as a solvent of such animal and vegetable principles as are not readily dissolved in a watery fluid, or, when so dissolved, do not keep well; thus forming numerous tinctures. In the state of proof spirit, or diluted so as to have a specific gravity of about 935, it is given internally, with advantage, in certain spasmodic and gouty affections of the stomach, and in some paralytic cases arising from debility. Still stronger, in the state of rectified spirit of wine, of the specific gravity 835, it is a good external remedy in recent burns, scalds, and chilblains; and when still more highly concentrated into pure *alcohol*, of the specific gravity 815, it is employed chiefly in the preparation of ethers. The indiscriminate, or long continued use of ardent spirit as tincture, is as much to be deprecated in medicine as in diet.

Vinegar.—The impure acetic acid, or vinegar of commerce, is generally much diluted, and contaminated with mucilage. It is concentrated by freezing, and purified by distillation, in which state it should always be used for medical purposes. It is employed internally, as a refrigerant and allayer of thirst in fevers; as an antidote to narcotic poisons; as a gentle diaphoretic in the form of vinegar whey. Externally, it is used, mixed with water, as a wash, in febrile affections, in headach, in contusions, and sprains; and undiluted, in recent burns.

Impure *subcarbonate of potash*, or the pearl-ashes of commerce, is used chiefly for preparing the purified alkaline salt of the same name.

Ammoniacum, or gum-ammoniac, is a gum-resin, brought from the East Indies, and is the concrete juice of some plant whose botanical history is imperfect. It appears in masses, containing small particles of a yellowish colour externally, and white within, which are the pure ammoniac. This drug has a strong but not unpleasant odour, and a pungent bitterish flavour. It is given in substance in the form of pills; and diffused in water as an emulsion, in the dose of 20 or 30 grains, chiefly as an expectorant, in chronic affections of the chest. It is also applied externally, by way of plaster, as a stimulant, in indolent tumours.

Myrrh is another gum-resin, of uncertain origin, brought from Abyssinia and the East Indies, in lumps, of a reddish colour, a fragrant smell, and bitter taste; brittle, but not very friable. The powder is of a brownish-yellow colour. It is given in the same forms and cases as ammoniacum, but is considered more heating, and is used in smaller doses. It is also used as a stimulant and tonic, in cases of general debility and uterine obstruction. It is a good ingredient in tooth-powder.

Columbo root, probably a native of India, is brought from Ceylon, in thin circular pieces of a greenish-brown colour, with little odour, but a strong bitter taste; is a valuable tonic, given in powder in the dose of 10 or 20 grains; in infusion, and in tincture, as a remedy for weakness and laxity in the stomach and bowels, loss of appetite, and morning sickness.

In traversing the systematic classification of vegetables, we are presented with a numerous host of remedies, but comparatively few of them are now considered of great importance. Following the Linnæan arrangement, we begin with the class MONANDRIA, from which only six species have been retained by the colleges; namely, Round zedoary, *kaempferia rotunda*; turmeric; ginger; long zedoary, *amomum zedoaria*; lesser cardamom; and galangal roots, *maranta galanga.*

Ginger, the root of the *amomum zinziber*, is imported from the West Indies, in two states, preserved in syrup when recent, and dried. The former is one of the most wholesome of the sweetmeats for those who have a weak stomach. The dried root should be smooth, and of a yellowish-white colour on the surface, but yellow within; should be easily cut, and grated; should have a strong smell, and a hot pungent taste. The powder should be of a bright yellow colour. Ginger is the safest, and least heating of all the species; and is given with great advantage in all cases that indicate a weak state of the stomach, in powder, infusion, or tincture. The usual dose of the powder is from 10 to 30 grains, but it is often taken in greater quantities, especially in atonic gout. It is a good addition to the vegetable purgatives, and, when chewed, sometimes relieves toothach.

Lesser cardamom seeds, produced by the *amomum cardamomum*, or *A. repens*, are imported in short three-sided pods, of a light brown colour, from the East Indies. The seeds are of a dark brown colour, have a pleasant odour, and a warm saltish taste. They are employed as a stimulant for weakness of the stomach, in the form of powder, mixed with other spices, and as a tincture.

From the class DIANDRIA, are derived seven remedies: Olive oil; hedge hyssop, *gratialis officinalis*; rosemary; sage; brooklime, *veronica beccabunga*; black pepper, and long pepper.

The *oil* expressed from *olives* is imported from the south of Europe and the Levant. The best, commonly called *Florence oil*, is of a rich yellow colour, without smell, and almost without taste; transparent at ordinary temperatures, but congealing, at 38° of Fahrenheit, into an opaque, granular mass. Olive oil is much used in medicine as an emollient, chiefly in the preparation of ointments, and to dissolve or dilute certain stimulating remedies employed for friction. It is also given internally to expel worms, and in large doses to sheath the stomach and bowels against the action of mineral poisons.

The fresh tops of rosemary, and the essential oil distilled from them, are used as gentle stimulants. An infusion of the former is said to accelerate the growth of new hair.

Sage, formerly so celebrated as to be supposed capable of prolonging life, "*Cur moritur homo, cui salvia crescit in horto?*" is now scarcely used, except in domestic medicine, as forming a refreshing drink in fevers, or a good gargle in sore throats.

Black pepper is imported from the East Indies, and is sometimes used in very fine powder, mixed with lard, for rubbing paralytic limbs. A few grains of white pepper, which is the same fruit deprived of its bark, swallowed before meals, promote digestion. *Long pepper* is used chiefly as an ingredient in aromatic powder.

The class TRIANDRIA furnishes eight remedies: Valerian; saffron; orris root; water-flag; sugar; oats; wheat starch; and pearl barley.

Valerian root, taken from the wild plant growing in a dry situation, is a valuable stimulant and antispasmodic. Each root is composed of several coarse brown fibres, matted together, of a strong unpleasant smell, and an acrid bitter taste. It is given in powder, mixed with a little mace or nutmeg, in doses of 15 or 20 grains, in infusion, and in the form of tincture chiefly in hysteric and hypochondriacal affections.

The stigmata of the *crocus sativus*, cultivated in the south of England, when collected and pressed together into a thin circular cake, form what is called *saffron*. It should be moist, of a deep orange colour, a fragrant smell, and a sweet aromatic taste. It is a gentle stimulant, supposed to promote perspiration, and therefore given in the forms of infusion, syrup, or tincture, in certain eruptions of the skin.

Sugar, as a medicine, is a gentle laxative, but apt to excite gripes and heart-burn. It is used chiefly to cover the taste of unpleasant drugs, and in the form of syrup to prepare electuaries.

Oats, in the form of meal, or still better when merely deprived of their outer husk, and then called *grots*, are used for making gruel, which is an excellent emollient in feverish and inflammatory complaints, and after the application of blisters.

Wheat starch, when gradually mixed with cold water, and then boiled into a thin mucilage, is administered with advantage, in the form of *clysters*, in violent purgings and dysentery. Powdered starch is also a good remedy for excoriations of the skin.

Pearl barley is used for making barley-water, which, as a demulcent, is in many cases preferable to water-gruel, being less flatulent, and less apt to excite heartburn.

Only three remedies are derived from the class TETRANDRIA: Sarcocol, madder, and contrayerva root, and none of these is of particular importance.

About forty-six remedies are derived from the class PENTANDRIA; namely, Alkanet root, *anchusa tinctoria*; Carolina pink, *spigelia Marylandica*; marsh trefoil, *menyanthes trifoliata*; *scammony*; jalap; thorn apple; henbane; tobacco; lesser centaury, *chironia centauream*; nux vomica, *strychaos nux vomica*; capsicum; bitter sweet, *solanum dulcamara*; belladonna; Peruvian bark, Caribbean bark, *cinchona Caribboea*; angustura bark, *lobelia syphilitica*; ipecacuanha; buckthorn; wine; raisins; tartar; sweet violet flowers; red currants; black currants; gentian; elm-bark, eryngo root; carrot; hemlock; creeping skirret, *sium nodiflorum*; cummin seed; assafœtida; galbanum, angelica; coriander seed; caraway seed; opoponax; dill seed, *anethum graveolens*; sweet fennel seed, *anethum foeniculum*; parsley seed; anise seed; elder leaves, bark, and berries; toxicodendron; lint-seed, and purging flax, *linum catharticum*.

Scammony is a concrete resinous juice, of a dull grey or green colour, a faint smell, and an acrid bitter taste, brought from Syria and the Levant, and extracted from the roots of the *convolvulus scammonium*. It is a strong purgative in the dose of about ten grains, and given in cases of dropsy, and to expel worms.

Jalap is the dried root of the *convolvulus*, or *ipomea jalapa*, and is brought to us from North America, in globular or hemispherical masses, of a blackish-brown colour on the outer surface, and a light brown within, having a nauseous smell, and an unpleasant bitter taste. The powder is light brown, and easily concretes into lumps. Jalap is a very useful purgative, and is given in doses of about 20 grains of the powder, mixed with syrup. When ground with crystals of tartar its effect is increased. The extract and tincture are also used with advantage.

Henbane, *hyoscyamus niger*, is a narcotic plant, growing commonly in some parts of Britain, on rich waste ground. The juice, expressed from the fresh leaves, is evaporated to a soft extract, of a brownish-black colour, a heavy smell, and a sweetish taste. In this state it is commonly employed in the dose of three or four grains, to relieve pain, allay irritation, and procure sleep. It is a good substitute for *opium*.

Tobacco.—This well known narcotic, imported in large quantities from America, but easily cultivated in this country, when used in moderation, is a valuable remedy, in many cases, to those who have not habitually abused it. The half-dried leaf, chewed or smoked, excites the salivary glands to increased secretion, and thus often relieves toothach; and the simple powder, used as snuff, increases the secretions from the nose and eyes, and relieves nervous headach, and clears the eye-ball. Tobacco smoke thrown up the bowels sometimes cures obstinate colic, and helps to restore suspended animation. Infused in wine, tobacco is given internally as a diuretic in dropsy.

The ripe pods of the *capsicum annuum*, when dried and reduced to powder, under the name of Cayenne pepper, is a powerful stimulus, and is given in small doses of two or three grains in the advanced stage of low fever, in malignant sore throat, in atonic gout, and in some paralytic affections. Made into a gargle with vinegar and water, it is one of the best remedies in ulcerated sore throat, and even in inflammatory sore throat, after the inflammation has subsided, to prevent a relapse.

The bark of several species of *cinchona*, commonly called the Peruvian bark, and emphatically *the bark*, is imported from the north-western provinces of South America, under three principal forms and denominations, pale, or quill, yellow, and red bark. The first, derived from the *C. officinalis*, or *lancifolia*, is small, thin, and rolled up into cylinders, whitish without and brown within. The second, from the *C. cordifolia*, is flat, broad, thicker than the former, and within of a darker yellowish-brown colour. The third is derived from the *C. oblongifolia*, is a little rounded, very thick, of a coarse fibre, and of a dark red colour when broken. When powdered, each presents the colour of their respective insides, except that the second is paler than the first. These barks have little smell, but their taste is more or less bitter and astringent, and is strongest in the red species. It is not easy for any person, but a druggist or apothecary, to judge of their goodness, and they should always be purchased from the most respectable dealers. Cinchona is one of the most valuable tonics in the Materia Medica; and though its reputation stands not quite so high now as formerly, this is to be imputed more to its being kept too long by the merchants or druggists, than to any general inferiority of the drug. When sound, freshly powdered, and genuine, and given in sufficient doses, 2 scruples, or a dram every hour during the interval, it is almost a certain remedy in intermittent fevers, and is very efficacious in incipient gangrene, malignant sore throat, chronic rheumatism, and in most cases of general debility. It is given in substance in the form of powder or electuary, in infusion, docoction, tincture, or extract; but where the stomach will bear it, the first form is the best.

The bark called *angustura*, imported from the West Indies, is the produce of an American tree, called by Humboldt *Bonplandia trifoliata*. Its appearance differs according to its size; but in general it is flattish or half round, pretty thick, of a dull yellowish-brown colour within, and greyish on the back; when powdered it is nearly yellow. It has a fragrant smell, and an aromatic bitter taste. This bark is an astringent tonic, useful in obstinate purgings and protracted dysentery. It is given in powder, in a dose of 20 grains, in infusion, decoction, and tincture.

Ipecacuanha is the root of the *cephaelis*, (or according to some writers, the *callicocca ipecacuanha*. It appears in short crooked pieces, about the size of a crow quill, and consisting of a central white woody string, encrusted with a thick, rough, brittle bark, of a dark brown colour. The powder of these roots is nearly white, has an unpleasant smell, and a nauseous bitter taste. Ipecacuanha is another of our most valuable remedies, answering different purposes, according to the dose and composition. In powder, in the dose of 20 or 25 grains, or infused in white wine, it is a safe and mild emetic, particularly suited to children in proportional doses. Two or three grains gently move the bowels, assist in the expectoration of mucus from the throat and chest, and a grain or two, combined with opium, acts on the skin. It is given with advantage at the commencement of feverish complaints, in rheumatism, catarrh, and pulmonary complaints, in diarrhoea and dysentery, in indigestion, in small morning doses, in asthma, chincough, and jaundice, as an emetic.

The ripe berries of the buckthorn, *rhamnus catharticus*, a wild shrub common in the south of England, are used in forming a syrup which is a good purgative.

Four kinds of foreign wine, sherry, rhenish, claret, and red port, are usually employed in medicine; the first two for extracting the active principles of other remedies, the third as an astringent in certain hemorrhages without fever, and the fourth as one of the best cordials in the low stage of typhus fever, the debility following other febrile, eruptive, and inflammatory diseases, and in some spasmodic affections, particularly *tetanus*. *Raisins* are used as emollients and laxatives, usually in the way of decoction.

Tartar, or impure supertartrate of potash, is the saline incrustation that collects on the inside of foreign wine casks. When purified, it is called crystals, or cream of tartar, and is in very general use as a refrigerant, laxative, and diuretic. From its superabundance of acid, its frequent or long continued use is considered improper by many practitioners.

Black currants, in the forms of syrup and jelly, are among the best demulcents and cooling remedies in affections of the throat.

Gentian, the root of the *gentiana lutea*, is brought from the south of Europe in pieces of various sizes. It is long, round, furrowed on the surface, of a brown colour, scarcely any smell, but an intense bitter taste. It should be moderately dry, but so soft as to be easily cut. Gentian is one of the simple bitters, and is given as a tonic, in the forms of infusion, wine, tincture, and extract, in indigestion and weakness of the stomach and bowels.

The roots of the cultivated carrot grated, form a good application in cancerous sores and foul ulcers.

Hemlock, though a deadly poison when eaten in any great quantity, is in some cases a valuable medicine. The fresh leaves bruised and boiled, or the dried leaves powdered and mixed with bread and milk into a poultice, relieve painful swellings [and ulcers; and the powder of the leaves, in the dose of 5 or 10 grains, or the extract in a smaller dose, is sometimes useful in schirrhous and cancerous affections. But it has often failed, and its use requires caution.

Assafoetida, a concrete gum-resin, derived from the *ferula assafoetida*, is brought from Persia, in masses of a pale reddish colour, variegated with white, with a very strong offensive smell, and an acrid bitter taste. It should be dry, but not too hard or brittle. It is one of our best antispasmodics, suited to hysteric and hypochondriacal affections, epilepsy, chorea, and chincough, and is a good stimulant in flatulence of the stomach. Given in substance as pills, dose 5 or 10 grains, in emulsion or tincture.

Galbanum is of much the same nature, and used in similar cases.

The warm aromatic seeds of *coriander*, *caraway*, *dill*, *fennel*, and *anise*, are employed as carminatives to relieve flatulence. The best are caraway and anise, or rather their essential oils. Dose, a drop or two on sugar.

Lint or *flax* seed is a good emollient and demulcent, given in infusion in coughs and disorders of the chest, and drunk copiously after the application of a blister, to prevent strangury. The powder or meal, mixed with hot water, forms a speedy and efficacious poultice.

The class HEXANDRIA affords eleven remedies: The fruit of the barberry, garlic, onion, leek, aloes, squill, white lily root; sweet flag, *acorus calamus*; colchicum; sorrel; and great water dock, *rumex aquatus*.

Garlic roots are occasionally given in flatulence, and to expel worms. When beaten to a pulp and mixed with lard, they form a good stimulant, applied to the soles of the feet, in cases where the circulation is very feeble.

Aloes is the concrete juice of several species of *aloe*, and appears in three principal varieties;—*Socotrine*, derived from the *Al. spicata*, and brought from the East Indies, in moderate pieces, of a dull brown colour, becoming yellowish when powdered, and having little smell; *Barbadoes*, from the *Al. vulgaris*, imported from the West Indies, in large lumps, of a shining black colour and vitreous fracture, having a strong but not unpleasant smell, and forming a dark brown powder; and *Cape* or horse-aloes, the produce of an uncertain species, and imported from Southern Africa, very friable, and of a very disagreeable odour. All have a nauseous bitter taste. Aloes is one of the most common and useful purgatives, acting chiefly on the large intestines. It is given in powder or pills, in doses of 5 or 10 grains, in wine or tincture. The socotrine is considered the mildest, the Barbadoes the strongest. Their long continued use is thought to predispose to piles.

Squill is the fleshy bulbous root of the *scilla maritima*, and is brought from the south of Europe and the Levant. When fresh, it is of a reddish colour, turning, when dried, to a brownish-white. It consists of thick layers, overlapping each other, but not concentric; has a faint smell, and an acrid bitter taste. It is expectorant and diuretic, and is given in substance, as powder or pill, in doses of one, two, or three grains; in pulmonary or dropsical complaints unattended with fever, in vinegar, syrup, or tincture.

During the use of squill, it is proper to drink copiously of mucilaginous diluting liquors.

Only one remedy, the bark of the horse-chesnut, is derived from the small class HEPTANDRIA. That bark is an astringent tonic, and is employed as a substitute for the cinchona.

The class OCTANDRIA furnishes only four remedies: Gum elemi; balsam of Gilead, *amyris Gileadensis;* mezereon bark; and great bistort, *polygonum bistorta.*

The bark of the *daphne mezereum,* cultivated in our gardens, is given in the form of decoction, as a diaphoretic and gentle stimulant, in rheumatism and eruptions of the skin.

Six remedies are drawn from the class ENNEANDRIA: Cinnamon, cassia bark, camphor, bay berries, sassafras, and rhubarb.

Cinnamon is the bark of the *laurus cinnamomum,* imported from the East Indies in long cylindrical bundles, each piece being very thin and smooth, of a bright brown colour, a fragrant smell, and a hot sweet taste. *Cassia,* the bark of the *laurus cassia,* has the same smell and taste, but is thicker, coarser, and darker. Both are used as aromatic stimulants, in substance, powder, electuary, distilled water, spirit, and tincture. All their virtues, except a slight astringency, reside in their essential oil, which is so strong that a drop or two is a sufficient dose. The buds of the cassia are often used instead of the bark.

Camphor is a concrete inflammable substance, derived from the *laurus camphora,* brought from Japan to Holland, whence we receive it purified, in the form of thick convex-concave cakes, of a white colour, breaking with a granular surface, but smooth and glossy when cut, with a very strong penetrating smell, and an acrid bitter taste. It is an active stimulant and antispasmodic, particularly suited to cases of great irritability and exhaustion; but its internal use, except in the mild form of camphorated mixture, requires the superintendence of a medical practitioner. Externally it is employed, dissolved in oil or alcohol, in rheumatism, spasms, old sprains, indolent swellings, and a few other cases.

The root and branches of the *laurus sassafras,* brought from America, when cut into chips or shavings, and given in the form of infusion or decoction, is a warm diaphoretic and gentle stimulant, useful in some chronic affections of the skin.

Rhubarb.—The roots of two species of rhubarb, *rheum palmatum* and *rh. undulatum,* are employed in medicine. The former is brought from Russian Tartary, and sold by the name of Russian or Turkey rhubarb. It is in roundish angular pieces, usually with a hole through the middle; of a fine grain, and rich reddish-yellow colour, easily cut and ground, of a fragrant smell, and not unpleasant bitter taste. The latter, brought from China, under the name of Indian rhubarb, is in rounder pieces, without a hole, of a denser, harder, and coarser texture, a lighter colour when powdered, of little smell, and a more unpleasant taste. The roots of the rhubarb plants cultivated in Britain are of an intermediate quality and appearance. All these roots are moderately purgative, in the dose of 20 or 30 grains, the Indian being the strongest, the Russian the mildest and least apt to gripe or nauseate; but all are supposed to produce a tendency to costiveness. Rhubarb is given in the forms of powder, bolus, pill, watery or vinous infusion, and tincture.

From the class DECANDRIA are derived about eighteen remedies, namely: Balsam of Peru, balsam of Tolu, cassia fruit, *cassia fistula;* senna; logwood, mahogany bark, Swietenia bark, guaiacum, rue; simarouba, *quassia simaruba;* quassia, rhododendron, whortle-berry, storax, Benzoin, balsam of Copaiva, clove july-flowers, and wood sorrel.

Balsam of Tolu, drawn from the *toluifera balsamum,* a native ofSpanish America, is usually seen in a solid mass, of a yellowish-brown colour, with a tinge of red; when broken, of a very fragrant smell, and a warm sweetish taste. It is a warm stimulant, and given in the forms of syrup and tincture in tickling coughs and chronic affections of the chest.

Senna leaves, the produce of the *cassia senna,* and probably some other species, are brought from Alexandria and the East Indies. The former is the best, and is distinguished by the smallness, smoothness, and light yellowish-green colour of the leaves, while those of the latter are usually large, thin, and of a brownish cast. Senna is an excellent purgative, in the dose of two or three drams, infused in boiling water, with a little ginger.

Guaiacum.—Both the wood and resin of the *guaiacum officinale,* brought from the West Indies, are stimulant, and diaphoretic or diuretic. The former, in the state of raspings, is employed to form a diet drink, useful in some affections of the skin. The resin is naturally of a yellowish-brown colour, which changes to a bluish-green on exposure to the light. It is given in the form of powder or tincture, in rheumatism and flying gout. Dose of the powder, about 20 grains.

The expressed juice and essential oil of *rue* are favourite domestic remedies in worm cases.

The root of the *quassia excelsa,* a native of the West Indies, reduced to chips or shavings, is a strong bitter, and, when infused in hot water, or made into a tincture, forms a good tonic medicine in weakness of the stomach.

Only four remedies are selected from the class DODECANDRIA: Asarabacca, *asarum Europeum,* the leaves of which are used as snuff; white canella bark, a warm aromatic; agrimony; and euphorbia, the gum resin of *euphorbia officinalis.*

The class ICOSANDRIA furnishes about fourteen remedies: Cloves; Jamaica pepper, *myrtus pimenta;* pomegranate; sweet almonds; prunes; quince seeds; red rose-buds; damask rose petals; dog-rose hips; raspberries; tormentil root, a strong astringent; cinquefoil; and the root of avens, *geum urbanum,* considered a good indigenous substitute for cinchona.

Cloves are the dried calyces of the *eugenia caryophyllata,* a native of the Molucca islands. They rank among the most heating of the spices, and are used to rouse and invigorate a weak stomach, to relieve spasm, and to correct the unpleasant flavour or griping quality of other medicines. The essential oil, when genuine, is one of the best applications in toothach.

About nine remedies are furnished by the class Polyandria, namely: Wild poppy petals; white poppy heads, and opium; ladanum; stavesacre; blue monkshood; winter's bark; black hellebore; and fetid hellebore.

The wild *red poppy* is slightly, and the white cultivated species, *papaver somniferum*, powerfully narcotic. The dried heads or capsules of the latter are used in the form of decoction for anodyne fermentation, and from them is prepared a syrup which is given to children as a soporific. But the chief produce of the plant is the milky juice, collected from the full grown but green heads, while growing, after it has been thickened by exposure to the air, and called *opium*. Good opium has been collected from the cultivated poppy in Britain; but the best comes from Turkey, and the second best from the East Indies. The former is in flattened roundish lumps, rough and husky on the outside, but within smooth, firm, but moderately soft and tenacious, of a dark brown colour, a strong heavy smell, and a warm, acrid, bitter taste. Indian opium is in rounder lumps, of a darker colour, a softer consistence, a more unpleasant smell, and a less bitter taste. Opium, when judiciously employed, is one of the most valuable articles of the Materia Medica. It allays nervous irritation, resolves spasms, alleviates pain, soothes mental distress, exhilarates the spirits, checks inordinate discharges, promotes perspiration, and procures sleep. It is given with advantage in the low stage of fevers, in rheumatism, gout, toothach, and some other painful diseases,—in confluent small-pox, in passive hemorrhages, in obstinate purgings, and protracted dysentery,—in tetanus and hydrophobia, in some cases of mental alienation, in jaundice, in calculous affections, and in irritation of the urethra. It is administered in the forms of powder, pill, bolus, electuary, tincture, and clyster, and applied externally as ointment, liniment, embrocation, plaster, fomentation, and lotion. The usual dose of solid opium is one grain, but in certain cases it is increased to two or three grains, or the ordinary dose is repeated at short intervals. The internal use of opium is often followed by some unpleasant effects, as headach, giddiness, sickness, thirst, costiveness, and tremors. They are obviated or counteracted by combining with it lemon-juice, cinnamon, rhubarb, calomel, or antimonial wine, or by drinking, some hours after taking it, lemonade, wine, or strong coffee.

The class Didynamia furnishes about twelve remedies: Hyssop, spearmint, peppermint, pennyroyal, lavender, herb mastich, water germander, horehound, origanum, marjoram, baum, and fox-glove. Most of them are gently stimulating; some, as peppermint, pennyroyal, origanum, and marjoram, are warm aromatics, and the essential oil of origanum often cures toothach.

Foxglove.—The leaves of the *digitalis purpurea*, a wild plant, pretty common on dry gravelly soils, constitute another important medicine, particularly useful in consumption and dropsies, but requiring the guidance of medical practitioners. It is given in substance in the form of powder or pill, in infusion, and in tincture. As physicians are not agreed respecting the action and use of this remedy, it would be improper, in a popular treatise, to enter into any discussion on them, and it is therefore thus hastily dismissed.

Six remedies are supplied by the class Tetradynamia: Scurvy-grass, horse-radish, cardamine, white and black mustard, and water-cress.

The root of *horse-radish, cochlearia armoracia*, is a useful stimulant in debility of the stomach, either in substance cut into small pieces and swallowed whole, or in the form of a distilled spirit.

Mustard-seed, swallowed whole, is given with a similar intention, and in paralytic torpor of the bowels. The powder, or flour, made into a poultice with bread and vinegar, is applied externally to excite heat and rouse nervous sensibility.

Only three remedies are taken from the class Monadelphia: Tamarinds, the fruit of the *tamarindus Indicus*, brought from the West Indies preserved in sugar, and used as a laxative; the common mallow; and marsh-mallow root, *althaea officinalis*.

The class Diadelphia furnishes ten remedies: Fumitory; seneka-root, *polygala senega*; red sanders-wood; dragon's blood; common broom, *spartium scapurium*, the tops of which are employed as a diuretic; cowhage, *dolichos prurien*, the spiculae of whose pods, mixed with syrup, are given to destroy worms; gum-dragant, *astragalus tragacantha*; liquorice-root, and its inspissated juice, used as a demulcent in coughs; cabbage-tree bark, *geoffraea inermis*, recommended in worm cases; and fenugreek.

Four remedies are supplied by the class Polyadelphia: Seville orange; lemon; cajeput oil; and St John's wort, *hypericum perforatum*.

The juice and peel of *Seville oranges* contain an aromatic bitter, very grateful to the stomach, which renders the common orange marmalade a very wholesome as well as elegant sweetmeat. The peel chiefly is used in medicine; when fresh, in the form of conserve, when dried, in the forms of infusion and tincture.

The juice and peel of the lemon are also very useful. The juice, in lemonade, forms a refreshing beverage in feverish and inflammatory complaints, and is one of the best antidotes to opium and other narcotic poisons. The fresh peel, and its essential oil, are grateful stimulants.

The essential oil of the *cajeput* tree, *melaleuca leucodendron*, brought from Amboyna, is a powerful stimulant, given internally, in some spasmodic diseases, in the dose of two or three drops, and applied externally in old sprains and chronic rheumatisms.

From the class Syngenesia, are derived about sixteen remedies: namely, Dandelion; wild lettuce; garden lettuce; burdock root; artichoke leaves; southernwood; sea wormwood; wormseed; wormwood; tansy; leopard's bane, *arnica montana*; elecampane; golden rod; colts'-foot, *tussilago farfara*; chamomile; Spanish pellitory; and blessed thistle, *centaurea benedicta*.

The leaves of the wild lettuce, *lactuca virosa*, have been successfully employed in the form of extract, as a diuretic, in the cure of dropsy.

The garden lettuce, when in flower, furnishes a milky juice, of a heavy smell and bitter taste, which, when inspissated, possesses most of the properties of opium, and is now commonly employed, under the name of *lactucarium*, as a substitute for that drug.

The tops of *common wormwood*, *artemisia absinthium*, form a good bitter tonic, very grateful to the stomach. They constitute an ingredient in the cordial commonly sold under the name of *bitters*.

Tansey leaves, or the expressed juice, form a good remedy for expelling worms.

The dried flowers of chamomile, *anthemis nobilis*, form a simple, but valuable medicine. In powder, in the dose of twenty grains, they act as a vermifuge. The infusion, when strong and taken warm, excites or promotes vomiting,—when cold, acts as a tonic, strengthens the stomach, and excites appetite. The decoction forms a good fomentation, and the boiled flowers, mixed with a little lard, make an excellent poultice. The English chamomile is the more delicate, but the Scotch is regarded as the stronger, probably from being more dried.

The dried root of the Spanish pellitory, *anthenis pyrethrum*, has a warm, acrid, saltish taste, and when chewed, promotes the secretion of saliva, and often relieves toothach.

Only two remedies are derived from the class GYNANDRIA: Virginian snake-root, and wake-robin root, *arum maculatum*.

Virginian snake-root, *serpentaria Virginiana*, is brought from North America, in tufts of very slender fibres, of a brown colour, a fragrant smell, and aromatic taste. It is given as a stimulant, in the forms of powder and tincture, in cases of debility. Dose of the powder, about 20 grains.

The class MONOECIA supplies about twenty remedies, namely: Nutmegs and mace; birch juice, a gentle diuretic; mulberries; stinging nettle, occasionally employed as an external stimulant in palsy; oak-bark, a powerful astringent; gall nuts; unripe walnuts, used as an astringent; Burgundy pitch; frankincense; balsam of Canada; Venice turpentine; oil of turpentine; tar; common turpentine; rosin; castor-oil; cascarilla bark, *croton eleutherium*, a warm tonic; wild cucumber; bitter apple; and white bryony root.

The kernel of the nutmeg and the scales that envelope it, and are called *mace*, are brought from the East Indies, and used in medicine as heating stimulants, and correctors of nauseous drugs. The distilled essential oil of nutmeg, and the expressed oil of mace, contain the aromatic principle in a concentrated state.

Gall-nuts are excrescences formed on the *quercus cerris*, or what M. Olivier calls *Qu. infectoria*, by a species of cynips, commonly called the gall insect. They are brought from the Levant: are of a globular form, a brown colour, more or less dark, and of an austere rough taste. They are the most powerful of all astringents, but are seldom used in medicine, except in preparing a gargle in relaxations of the uvula, and in powder mixed with lard as an ointment for the piles

The genus *Pinus* supplies a great variety of stimulant remedies. From the common or Scotch fir, *P. sylvestris*, are procured common turpentine, tar, pitch, oil of turpentine, and rosin; from the larch, *P. larix*, Venice turpentine, and a pure and more limpid oil; from the hemlock fir, *P. balsamea*, a finer juice called *balsam of Canada*; and from the spruce-fir, *P. picea*, frankincense and Burgundy pitch. Most of these products, especially the turpentines, tar, and rosin, are used in forming stimulating ointments and plasters for drawing and exciting indolent ulcers, or removing cutaneous eruptions; Burgundy pitch, in forming warm plasters, for exciting the vessels of the skin; and frankincense is occasionally employed in fumigating the chambers of the sick. Balsam of Canada, and even common turpentine, have been given internally as diuretics. Tar and pitch have also been thus given successfully in certain affections of the skin. But the most valuable of these products is the purified *oil of turpentine*, which acts as a powerful and efficacious stimulus in many complaints. Given in small doses of about a dram, it relieves gravel, and checks hemorrhage from the bowels. Given in repeated dozes, to the extent of three or four drams in the course of the day, it has removed epileptic fits; and in large doses of two or three ounces, it has killed and expelled the tape-worm. Externally it is an excellent remedy in recent chilblains, scalds, and burns, in rheumatic pains, and in cold swellings.

Castor-oil is the expressed oil of the fresh seeds of the *palma Christi*, *ricinus communis*, and is brought from both the East and West Indies. The best is the cold drawn, which is of a very pale straw colour, and has little smell or taste. It is a mild and gentle purgative, in the dose of about an ounce for adults, and in that of a tea-spoonful or two is the best purgative for children.

Bitter apple, the dried fruit of the *cucumis colocynthis*, brought from Turkey, is a violent purgative, seldom given alone, and requiring caution in its exhibition.

About nine remedies are derived from the class DIOECIA: Willow bark, another indigenous substitute for cinchona; Chio turpentine, from the *pistachia terebinthus*; mastic, from the *pistachia lentiscus*; hops; *sarsaparilla*; juniper, a good diuretic, and forming the flavouring and active principle of gin; savine, the tops of the *juniperus sabina*; olibanum, from the *juniperus lycia*; and the root of pareira brava, *cissampelas pareira*.

Hops.—The leafy tops of the hop, *humulus lupulus*, so much cultivated in South Britain, and so extensively used in the brewing of malt liquors, possess a narcotic principle, which renders them a good substitute for opium, especially as a soporific. Sleep has been obtained by reposing on a pillow stuffed with fresh dried hops, when it rejected every other suitor, and two or three grains of the powder are equal to a grain of opium. It is also given in the form of tincture, and may be employed externally as a poultice.

The class POLYGAMIA furnishes about eight remedies: Gamboge, white hellebore; catechu; gum-arabic, an exudation from the *mimosa nilotica* brought from Africa, and used as an emollient and demulcent; pellitory of the wall, *pareitaria officinalis*; manna; gentian root, *panax quinquefolium*; and dried figs, the fruit of the foreign *ficus carica*, a gentle laxative.

Gamboge is a gum-resin derived from the *stalagmitis cambogioides*, and is brought from the East Indies, in lumps of an orange-yellow colour, producing a bright yellow when moistened with water. It has scarcely any smell, but a warm acrid taste. It is a violent purgative, producing watery evacuations, and esteemed useful in dropsical affections. It is also supposed useful in expelling the tape-worm. It is an ingredient in Anderson's purgative pills.

White hellebore, the root of *veratrum album*, given internally, is an active purgative, and is supposed to form one of the bases of the famous *eau medicinale*, so much vaunted of late in the cure of gout, but which is justly considered a doubtful if not dangerous remedy. Externally it has been used with success in itch and other cutaneous eruptions.

Catechu, improperly called Japan *earth*, is the inspissated juice of the *mimosa catechu*, and brought from the East Indies, in thick cakes of a dark reddish-brown colour, with scarcely any smell, but a very acerb sweetish taste. It is a powerful astringent, and given in the forms of electuary, mixture, or tincture, in violent looseness of the bowels.

Manna is a concrete saccharine juice, obtained from the *fraxinus ornus*, and some other species of ash. It is brought from Italy and Sicily, either in masses of little brown tears, or in long flakes of a light yellowish-brown colour. The latter is esteemed the best. Manna is a gentle purgative, much employed for children, in the dose of 30 to 60 grains.

The class CRYPTOGAMIA supplies four remedies: Male fern root; yellow bladder wrack, *fucus vesiculosus*; Iceland liver-wort; and agaric, *boletus igniorius*, formerly used externally as a styptic.

The root of *male fern*, *polypodium filix mas*, has been much extolled as a specific in removing the tape-worm; but its use is now nearly superseded by that of oil of turpentine. It is not a safe *domestic* medicine.

Iceland liverwort, lichen Icelandicus, a very nutritive mucilage, recommended in chronic affections of the lungs, especially consumption, and in debilitated states of the body. It is taken in the form of decoction or jelly.

The PALMS furnish one remedy, *palm oil*, derived from the *cocos butyracea*, a native of South America. It has the consistence of an ointment, and is used externally as an emollient.

SECT. III. *Of Remedies from the Mineral Kingdom.*

The mineral kingdom supplies about forty remedies, which may be conveniently classed under the following heads: WATERS, INFLAMMABLES, METALS, EARTHS, ACIDS, MINERAL SALTS, and GASEOUS BODIES.

Common *water*, besides its constant use as a cooling diluent in all febrile diseases, and as a solvent of most solid medicines, is employed as the vehicle of increased or diminished heat, in the forms of bath, lotion, or fomentation. Baths are of several denominations, according to the degree of their temperature or the mode of their application. The *cold-bath* has the ordinary temperature of the atmosphere, from 32° to 65°. The effects of the cold-bath vary according to its volume and temperature, the mode and continuance of its application, and the state of the patient's body at the time; but in general its ultimate effects, when beneficial, are stimulant, tonic, and antispasmodic. *Cold effusion*, and the shower-bath, are modifications of the cold-bath, useful in cases where general immersion would be improper, especially in diminishing morbid heat in febrile diseases. The *tepid*-bath, the temperature of which is between 65° and 85°, is used chiefly to diminish morbid heat, and for the purpose of ablution, and possesses no very remarkable medicinal properties. The *warm*-bath, between 85° and 97°, is at first gently stimulant and antispasmodic, but, if continued, relaxes the body and purifies the skin, in diseases of which it is eminently useful. It is improper in internal affections of the head or chest. The hot-bath, ranging from 98° to about 112°, is powerfully stimulating, increases the heat of the body and the fulness and frequency of the pulse, and excites perspiration.—The vapour-bath, or the exposure of the body to an atmosphere of steam, is a modification of the last, and is more effectual in increasing perspiration. Fomentation is a variety of the hot-bath, extremely useful in pains, sprains, and many other cases.

The *mineral waters* found in natural springs in Britain and other countries, are much employed in the prevention or cure of diseases, some being taken internally, some used externally, and some in both ways. Of the British springs, some are remarkable chiefly for their high temperature; as those of Bath, Bristol, Buxton, and Matlock; others are impregnated with carbonic acid, as at Cheltenham and Scarborough; some are sulphureous or impregnated with sulphurated hydrogen gas, as at Harrowgate, Moffat, and Kilburn; some are laxative, from containing purging salts, as sea-water, and the springs of Harrowgate, Moffat, Epsom, Pitcaithly, and Kilburn; and others are *chalybeate*, or impregnated with iron, as the Hartfeil Spa, near Moffat, and some springs at Cheltenham, Bath, Scarborough, Tunbridge, and Peterhead.

Three simple remedies are derived from the class of *inflammable* minerals,—sulphur, amber; and Barbadoes tar, or *petroleum*. *Sulphur* is of two kinds, *native*, or *sulphur vivum*, collected in the neighbourhood of volcanoes, of a dull grey colour, now seldom used, and *roll sulphur*, obtained artificially from metallic sulphurets. For medical purposes, this latter is converted into a powder by sublimation, and vulgarly called *flowers of sulphur*. Taken internally, sublimed sulphur acts as a laxative and diaphoretic, and externally it is used in the form of ointment, as a specific in some affections of the skin, especially the itch. For internal use, it is best mixed with milk or treacle.

Amber, in its natural state, as brought from the sea-shore, chiefly of the Baltic, is now used in medicine only for preparing *oil of amber*, which is a powerful stimulant and antispasmodic, and for its acid.

Nine *metals*, silver, copper, iron, lead, tin, mercury, zinc, antimony, and arsenic, supply remedies, or the bases of remedies. Pure *silver* is used only in forming a salt, to be afterwards mentioned. *Copper*, in the metallic state, is also not used medicinally, but two of its salts, the *sub-acetate*, or *verdegris*, and the *sulphate*, or *blue vitriol*, are much employed; the former as an external stimulant, and cleanser, to indolent, foul, and cancerous ulcers; the latter, internally, as a strong emetic, in doses of from 5 to 10 grains, and as a tonic in smaller doses; and externally in substance or solution, as a stimulant and escharotic to callous or fungous ulcers, and as a styptic in slight bleedings.

Iron is a valuable mineral tonic. It is used internally in the metallic state, in the form of filings, generally covered with sugar, in what are called *steel carvies*, for strengthening the stomach and bowels, and expelling worms; in the state of black oxide; in the scales collected about a smith's anvil, when purified and reduced to powder; and in the form of a salt, the *sulphate of iron*, green *copperas*, or *green vitriol*, though the sulphate of commerce is so impure as to be justly superseded by the officinal preparation of that name.

Lead, in the metallic state, is never used as a remedy; but in the forms of *white oxide, cerusse*, or *white lead*, *semivitreous oxide*, or *litharge*, and *red oxide, minium*, or *red lead*, it constitutes the basis of several compound external medicines, to be afterwards mentioned.

Tin is employed only in the metallic state, or very slightly oxidated, in the form of a granular powder, as a mechanical remedy against worms.

Mercury, or quicksilver, is largely used in medicine, as the basis of numerous preparations; but is rarely employed in the metallic state, and only as a mechanical remedy in colic. Its oxides and salts are powerful stimuli, and, according to their form and composition, act as emetic, cathartic, diaphoretic, diuretic, antispasmodic, or as stimulants either general or local, in a great variety of morbid affections. But their administration should in most cases be under the direction of a medical practitioner.

Zinc is not used as a remedy in the metallic state, except in assisting to communicate the Galvanic influence; but the native *oxide of zinc* or tutty, and the native *carbonate* or *calamine*, when finely levigated, are employed externally in the forms of powder, ointment, or cerate, for dusting or dressing excoriations, wounds, and ulcers. The *sulphate* of *zinc*, *white copperas*, or *white vitriol*, is given internally in a dose of 20 or 25 grains, as a speedy and powerful emetic, when poison has been recently swallowed, and in small doses as a tonic; and it is used externally in solution as a cooling astringent lotion in local inflammatory affections. For internal exhibition, this salt should be prepared by the apothecary.

What is commonly called *antimony* is an ore containing the metal in combination with sulphur, or is a *sulphuret of antimony*. It is not used in that state in human medicine, except for making the numerous preparations of antimony, which, according to their nature and composition, act as emetic, expectorant, diaphoretic, cathartic, stimulant, or antispasmodic, and form a valuable order of mineral remedies, suited to a great many cases, but, like those of mercury, requiring caution in their administration.

The *white oxide of arsenic*, commonly called *white arsenic*, is applied externally, in the form of solution, or of ointment, as a stimulant and escharotic to cancerous sores; and, though a virulent poison, is given internally, with great success, in the cure of intermittant fevers, and some obstinate affections of the skin.

About four simple remedies are derived from the class of *earths*,—soft carbonate of lime or *chalk*, hard carbonate of lime or *marble*, carbonate of baryta, and sulphate of baryta.

Chalk, in fine powder, is given internally as an antacid in heartburn and laxity of the bowels, and is applied externally to heal excoriations of the skin, and absorb moisture from burns and scalds. Both it and *marble* are also used in preparing pure lime for medicinal purposes, and in making other officinal preparations.

The *carbonate* and *sulphate of baryta*, the former of which is preferred, though the latter is much more easily procured, are used in preparing the barytic salts employed as a remedy for scrophulous affections.

The only mineral *acid* which properly belongs to this division is the *sulphuric*, commonly called *oil of vitriol*, which is prepared in large quantities by the trading chemist for its use in several manufactures as well as in medicine. In its usual concentrated state, it is sometimes used, in the form of ointment, as an external remedy in the itch; but when diluted with about seven times its weight of water, it is given with advantage as an astringent in hemorrhages, as a tonic in debility of the stomach, as a refrigerant and antiseptic in malignant fevers, and is used as a gargle in sore throats and ulcerated mouth, and as a lotion in some affections of the skin: when taken internally, it should be sucked through a quill, and the mouth washed after it, to avoid injuring the teeth.

Of the mineral salts, not metallic or officinal, about seven are employed as remedies,—sulphate of magnesia, alum, carbonate of soda, borax, nitre, and sea-salt.

Sulphate of magnesia, commonly called *Epsom salt*, as being formerly procured from Epsom water, is now prepared in large quantity, and great purity, from sea-water, by the trading chemists. It is an excellent purgative, in the dose of an ounce or an ounce and a half, and is particularly useful in smaller doses for loosening the bowels in indigestions and affections of the liver.

The substance called *alum* is a triple salt, with excess of acid, now properly denominated *supersulphate of alumina and potash*. It is obtained chiefly from alum, slate or Whitby aluminous clay, and is purified by solution and crystallization. It is given internally in doses of 10 or 15 grains as a tonic and astringent, especially in passive hemorrhages, and used as a gargle for sore mouths and relaxations of the *uvula*, and as a lotion in some affections of the skin and eyes. When deprived of its water of crystallization by heat, it forms a good stimulant application to fungous ulcers.

Carbonate, or rather *subcarbonate of soda*, though frequently obtained from the ashes of marine plants, under the forms of kelp and barilla, is strictly a mineral salt, and is procured in great purity by the decomposition of sulphate of soda. As a medicine, it is given internally, as an antacid, and as a remedy for gravelly complaints, in doses of 10 or 20 grains.

Soap, being generally prepared with soda, may be properly noticed under that substance. The soap commonly employed in medicine is the hard kind, called Spanish, or *Castille soap*. It is given internally, in combination with resinous or saline medicines, chiefly as a convenient mean of making them into the proper form. Its external use is less doubtful, and more extensive. When dissolved in ardent spirit, it is an excellent stimulus in sprains, bruises, and cramps. Diffused in water, it forms a good clyster in constipation of the bowels; and, indeed, the common yellow soap, cut into conical pieces, and used as a *suppository*, is an approved remedy in such cases, particularly in young children.

Borax, or *sub-borate of soda*, is a salt brought in an impure state from the East Indies, and afterwards purified. It is seldom given internally, though recommended as a diuretic, but is much used in the forms of powder and electuary, to remove crusts in the sore mouth of children. Alum is thought to be a safer remedy in these cases.

Nitre, saltpetre, or *nitrate of potash*, is a natural production, brought chiefly from the East Indies, and purified at home. It is given internally, in doses of 10 or 20 grains, as a diaphoretic, diuretic, or refrigerant, and is used in gargles for inflammatory sore throat.

Sea salt, or *muriate of soda*, is another natural salt, procured from sea water, or by the purification of rock salt, of which the latter is the purer. What are commonly called basket salt and mineral salt, are also very pure, and well adapted to medical purposes. This salt is seldom given internally, except to expel worms, in which it is said to be very efficacious. Externally it is employed as a stimulus in palsies and suspended animation, and dissolved in water as a bath or as a clyster. In this last form it also acts as a laxative.

Of the natural gaseous substances, and subtile principles, air, carbonic acid, heat, light, and electricity, may be ranked as remedies, since they exert a considerable influence on the system, both in health and disease. The necessity of pure *air*, in preserving and restoring health, is generally acknowledged, but it is more peculiarly required in all febrile and contagious diseases, in asthma, chronic weakness, or *asthenia*, and in convalescence from all acute diseases. Change of air is of the greatest benefit in hooping cough. *Carbonic acid gas*, dissolved in water, or as contained in brisk table beer, spruce beer, or ginger beer, acts as a gentle stimulant, or tonic, on the stomach, and as a refrigerant to the body in general. It is also applied, by means of fermenting poultices, to foul or cancerous ulcers, to correct putridity, and diminish their fœtid odour. *Heat* is a powerful stimulus, and, when judiciously applied, produces very beneficial effects in many cases of disease. Taken internally, in the form of warm drinks, it alleviates pain and spasms in the stomach, and promotes perspiration. Applied externally, either in the dry state, by means of hot cloths, heated bricks, or bottles or bladders containing hot water, or in combination with moisture, in the forms of bath, fomentation, or poultice, it relieves spasmodic and rheumatic pains, excites the action of the superficial vessels, promotes perspiration and absorption, and either checks inflammation or accelerates suppuration; and hence is useful in toothach, earach, sprains, boils, colic, gravel, suspended animation, and in the way of fomentation in inflammations of the bowels and kidneys. On the other hand, the application of *cold* is a useful remedy in cases of morbid heat, inflammatory fever, congestion, and inflammation of the head, and in some hemorrhages. *Light* is a stimulus, invigorating the body, and exhilarating the spirits.

Electricity is another active stimulus, less or more powerful, according to the degree and mode of its application. It quickens the pulse, promotes the secretions, increases nervous sensibility, and excites muscular contraction. It is applied in a stream, or *aura*, from a blunt pointed wooden or metallic conductor; in *sparks*, from a rounded conductor; or in *shocks*, from a Leyden phial; being weakest in the first, and strongest in the last mode. *Galvanism* is in many cases more effectual than common electricity, as in local paralysis, blindness, deafness, and suspended animation.

To conclude this brief account of simple remedies, it must be observed that *exercise* is a valuable remedy in many chronic diseases, especially in chronic rheumatism, partial paralysis, indigestion, low spirits, chronic weakness, chlorosis, and jaundice. It succeeds best in the open air, in walking, riding on horseback, swimming, and dancing. *Friction* is a species of passive exercise, eminently useful in rheumatism, paralysis, spasmodic pains, torpor, local swellings without inflammation, old sprains, stiffness of the joints, hardness of the ligaments, and several other cases, applied either with the hand or a flesh brush.

CHAP. II. PHARMACY.

The art of preparing and compounding medicines, to fit them for administration in the cure of disease, is called PHARMACY. It is partly a mechanical and partly a chemical art. By the mechanical processes of pharmacy, various simples are pounded, ground, sifted, strained, filtered, and formed into a proper consistence for exhibition. By the chemical processes the simples are dissolved, or their active principles extracted by various liquids, or by the aid of fire, or they are united so as to form more active or efficacious remedies. Some of these processes are usually conducted by the apothecary, others by the trading chemist.

SECT. I. *Of the Apparatus and Processes of Pharmacy.*

The *apparatus* employed in pharmacy consists chiefly of *mortars* of iron, marble, earthen-ware, especially that called Wedgewood's, and glass, with their appropriate *pestles*, for reducing solid substances to powder, or for rubbing together solids or fluids, or both, in order to mix them more intimately together; *rasps, files*, and *graters*, for comminuting those substances which do not admit of pounding or rubbing. *Sieves* of lawn, hair, or wirecloth, for separating the finer particles of powders, or pressing out the pulp of fruits; *slabs* of marble or some harder stone, for rolling masses for pills, mixing ointments, or grinding stony bodies to a fine powder; *bolus knives* and *spatulas: funnels* of tin-plate, glass, or earthen-ware; *syphons, strainers,* and *filters,* for drawing off clear liquors, nicely balanced *scales and troy weights, measures* of pewter or tin, and graduated measures of glass; well tinned *pans,* shallow *dishes* of wedgewood-ware; *pipkins* and *crucibles,* for boiling, evaporating, or melting; vessels of glass or earthen-ware with lids or stoppers for infusing and macerating; metallic *stills,* with *worm tubes* for distilling in the large way, and *retorts* and *receivers* for small quantities; Nooth's and Woulffe's apparatus for impregnating fluids with various gasses; *matrasses, cucurbits,* and other chemical apparatus for obtaining the finer particles of volatile solids by means of heat.

The *mechanical processes* of Pharmacy are, *pulverization,* including *levigation; trituration; sifting; elutriation* or washing, by which mineral powders are refined or purified; *decantation,* by which a clear liquor is poured or drawn off by a syphon from its lees or sediment; *filtration,* which is usually performed by means of blotting paper placed within a funnel; and *expression,* by which juices are extracted from herbs, leaves, flowers, and fruit, oils from seeds, and pulp from fruits. Roots, stalks, leaves, and barks, are pulverized in iron mortars; but more brittle substances, as gums, resins, gum-resins, and saline bodies, may be reduced to powder in a marble or wedgewood mortar. Levigation may be performed, on small quantities, by long trituration, in a glass, marble, or wedgewood mortar, but is more commonly executed on a slab of porphyry with a smooth stone of the same material. In this way, red coral, oyster-shells, crab's-eyes and claws, and chalk, are usually reduced to an impalpable powder, and then washed and dried, and are thus said to be *prepared.* Trituration is usually employed to effect mechanical mixtures of different powders, fluids, or unctuous matters with each other or with certain minerals. Sifting is best done with close sieves, consisting of a middle piece, which is properly the *sieve,* a bottom for receiving the powder, and a top for preventing the escape of the lighter particles.

The *chemical processes* are, *liquefaction,* by which solid, unctuous, and certain resinous substances, are rendered fluid by heat; *fusion,* by which solid metals are reduced to fluidity; *vaporization,* by which more or less of the fluid part of a liquid, soft, or crystallized substance is evaporated by heat, and which includes *ustulation* or drying; *charring* or burning to charcoal; *concentration* or increasing the strength of a liquid by abstracting its watery part; *inspissation,* or rendering a liquid so thick as to lose its fluidity but remain soft; and *exsiccation,* reducing it to a state sufficiently dry for powdering; *distillation,* by which water and vinegar are purified, ardent spirit drawn from vinous liquors, and essential oils from aromatic plants, and water and spirit are impregnated with volatile principles; *rectification,* by which spiritous liquors are rendered stronger, and essential oils are purified; *sublimation,* by which certain volatile products are raised, and collected, and purified, by means of heat, in a dry state; *coagulation,* or the conversion of an albuminous fluid into a solid; *solution,* or the perfect combination of a solid with a fluid, so that the latter shall remain transparent; *infusion,* by which the soluble parts of animal and vegetable matters are extracted, by their being steeped for a moderate time in water; *maceration* and *digestion,* by which the same parts are extracted by longer steeping, generally in a vinous or spiritous liquor; *decoction,* by which the soluble, but not volatile, principles of animal and vegetable matters are extracted by boiling; *precipitation,* by which a solution is decomposed and the required ingredient thrown down in the form of an insoluble powder, called a *precipitate; crystallization,* by which saline bodies are separated from their solutions in certain regular forms; *oxygenation,* by which metals and some other bodies are combined with oxygen, or converted into *oxides,* generally by long exposure to heated air, by long trituration, or by means of acids; and *deoxygenation,* or decomposition of an oxide, and *reduction* of it to the metallic state.

SECT. II. *Of the Preparation and Forms of Compound Medicines.*

Compound medicines are either *officinal,* comprehending the preparations recommended by the colleges of physicians, and usually kept ready made in druggists and apothecaries shops, or *extemporaneous,* that is, such as are occasionally prepared according to the prescription of a medical practitioner.

The officinal forms of medicines are usually arranged under the following heads: Powders, Electuaries, Pills, Troches, or Lozenges, Expressed Juices, Inspissated Juices, Extracts, Expressed Oils, and Oily preparations, Infusions, Decoctions, Mucilages, Syrups, Medicated Honeys, Medicated Vinegars, Medicated Wines, Tinctures, Distilled Waters, Distilled Spirits, Volatile Oils, Emulsions, and Mixtures, Preparations of Alcohol, Preparations of Sulphur, Acids, Alkaline Salts, Earths, and Earthy Salts, Metallic preparations, Cataplasms, Liniments, Ointments, Cerates, and Plasters.

Compound powders are formed from those substances which are neither too bulky nor too nauseous to be taken in this state, when mixed with a watery fluid, with syrup, or some other cohesive matter capable of suspending them; deliquescent salts, or any volatile substances, are improper. The ingredients are in general powdered separately, except in cases where their mutual attrition aids the pulverization, and they are afterwards mixed intimately together. They should be kept close and dry. The principal officinal powders are, Powder of aloes, with canella; P. of aloes, with guiacum, or compound P. of aloes; aromatic powder, or compound P. of cinnamon; comp. P. of chalk; the same with opium; compound P. of Ipecacuanha, or Dover's powder; comp. P. of jalap; comp. P. of Kino; opiate powder; comp. P. of scammony; and comp. P. of tragacanth.

Electuaries are soft medicines, composed of powders mixed with syrup, so as to be easily taken with a spoon, or swallowed in a globular mass. They are sometimes called confections. Such are the electuaries of cassia, of senna, of catechu, of opium, and of scammony. *Conserves,* also called confections, differ from other electuaries, in being formed of recent vegetable matters beaten up with sugar. The principal are those of almonds, orange-peel, hips, red roses, and rice.

The form of pill is very convenient for preparing those remedies which are not easily reduced to powder, or are too nauseous to be taken in that form, and which readily make a coherent mass that can be rolled and moulded. The usual weight of a pill is four or five grains, so that from one to four may constitute a dose. The following are the officinal pills, not including those formed from metallic preparations: Aloetic pills; pills of aloes and assafœtida; of aloes and colocynth; of aloes and myrrh; compound pills of assafœtida or galbanum; comp. pills of gamboge; pills of soap with opium; storax pills; opiate pills; comp. rhubarb pills, and squill pills. Pills, or the mass for forming them, should be kept in close vessels, but not in a damp place, that they may not become too hard, nor grow mouldy. For the first reason, too many pills should not be moulded at one time.

Troches, or lozenges, are seldom made by the apothecary, but generally by the confectioner or lozenge-maker, whose lozenges have a peculiarly neat appearance; but when they contain any active ingredient, as opium, neatness should be sacrificed to accuracy of mixture and division. The officinal troches are those of chalk, liquorice, liquorice with opium, of gum, and of nitre.

The only *expressed juice* that is officinal is the compound juice of scurvy-grass.

The officinal *inspissated juices,* sometimes called extracts, are those of aconite, belladonna, hemlock, henbane, wild lettuce, elder-berries; and among these is improperly ranked *elaterium,* or the *fecula* derived from the juice of the wild cucumber.

What are now more properly called *extracts,* including artificial *resins,* are prepared from various vegetable matters by boiling in water or macerating in spirit, or both, then straining the liquors, and evaporating them to a consistence fit for forming pills, called *soft* extracts, or for reducing to powder, called hard extracts. In the first way are prepared the extracts of wormwood, liquorice, black hellebore, gentian, jalap, roe, senna, savine, chamomile, white poppy, broom, logwood, oak-bark, and dandelion; the watery extr. of cinchona, compound extr. of colocynth, extr. of hops, the watery extr. of opium, and the extracts of sarsaparilla and valerian. In the second mode, the resinous extr. of cinchona, cascarilla, jalap, another comp. extr. of colocynth, and purified opium, are prepared; and in the third, extract of rhubarb and another extr. of jalap.

Fixed vegetable oils are expressed from almonds, lintseed, and the seeds of the *palma christi*; but they can scarcely be called officinal preparations, as they are not generally prepared by the apothecary or chemist.

The officinal *oily preparations* consist of fluid soaps, formed by the combination of ammonia or lime with olive oil, and called ammoniated oil and liniment of lime-water, and of solutions of camphor and sulphur in olive oil, constituting camphorated and sulphurated oils.

The officinal *infusions* are, tar-water, cold infusion of cinchona, cold infusion of gentian, all made with cold water; infus. of chamomile, comp. inf. of horse-radish, comp. inf. of orange-peel, infus. of columbo, of clove flowers, of cascarilla, London infus. of cinchona, inf. of angustura, of foxglove, comp. infus. of gentian, lintseed-tea, comp. inf. of mint, inf. of catechu, of quassia, of rhubarb, of roses, of senna, of senna with tamarinds, of simarouba, of tobacco, and of valerian, all made with boiling water. As infusions soon grow sour, unless a little spirit be added to them, they should be made only in small quantity at a time.

The following *decoctions* are officinal: Compound decoction of aloes, decoction of marshmallows, of chamomile, comp. dec. of mallow, dec. of cinchona, of mezereon, of foxglove, of cabbage-tree bark, comp. dec. of guaiacum, dec. of bitter-sweet, barley-water, comp. dec. of barley, dec. of Iceland moss, of poppies, of seneka, of oak-bark, of sarsaparilla, comp. dec. of sarsaparilla, dec. of elm bark, and dec. of white hellebore.

The officinal *mucilages,* or solutions of mucilage, are only four; those of starch, gum-dragant, gum-arabic, and quince seed.

Syrups are solutions of sugar, either in water, forming simple syrup, or in some infusion, decoction, or vegetable juice, forming the other officinal syrups, of marshmallow, clove-flowers, saffron, balsam of Tolu, violets, red roses, common roses, senna, buckthorn, orange-peel, lemons, mulberry, acetous acid, garlic, squill, colchicum, white poppy, opium, red poppy, and ginger. Syrups should be of such a consistence as neither to ferment from too little sugar, nor candy from too much. The usual proportion is two troy pounds of sugar to each wine pint of liquor.

Medicated honeys are syrups made with honey instead of sugar. The officinal honeys are now less numerous than formerly, and are used chiefly for gargles. They are simple oxymel, oxymel of colchicum, of squill, and of verdegris, honey of roses and of borax.

Medicated vinegars are formed by macerating or dissolving certain vegetable matters in distilled vinegar, or in strong acetic acid. The officinal preparations of this kind are aromatic vinegar, vinegar of squill and of colchicum, and camphorated acetic acid.

The officinal *medicated wines,* made by macerating vegetable matters in sherry wine, are those of aloes, ipecacuanha, tobacco, opium, rhubarb, and white hellebore. The name *tincture* is now given to all solutions of animal, vegetable, and mineral substances in ardent spirits, whether such solutions be coloured or limpid. Of the numerous officinal tinctures, most are prepared with proof spirit, (diluted alcohol,) as the tinctures of aloes, cardamom, compound of cardamom; T. of angustura, of snake-root, of orange-peel, of cascarilla, of castor, (Lond. and Dub.;) of capsicum, of cinchona, comp. of cinchona, comp. of cinnamon; T. of columba, of jalap, of saffron, of foxglove, of galbanum, of galls; comp. of gentian; T. of black hellebore, of hops, of henbane, of kino, of cinnamon; T. of cantharides, of catechu, of opium, commonly called *laudanum*; camphorated T. of opium, or London *paregoric elixir*; tinct. of quassia, of rhubarb, of rhubarb and aloes, of rhubarb and gentian, of squill, of senna, of valerian, of white hellebore, and of ginger. Many are prepared with rectified spirit, (common alcohol,) or with spirit of nearly that strength, as tincture of aloes and myrrh; comp. T. of Benzoin; tinct. or spirit of camphor, Edinb. T. of castor; T. of assafœtida, of guaiacum; comp. T. or spirit of lavender; T. of musk, of myrrh, of soap, commonly called *opodeldoc*, of soap and opium, or anodyne liniment, and of balsam of Tolu. Several are prepared with ammoniated alcohol, and called ammoniated or volatile tinctures, as compound liniment of camphor; comp. T. of castor; ammoniated T. of cinchona, of guaiacum, of opium, or Edinb. paregoric elixir, and of valerian. A few are prepared with ætherial spirits, as the ætherial tinct. of aloes, and aromatic sulphuric acid, or elixir of vitriol.

The term *distilled water*, formerly applied to spiritous as well as watery distillations, is now restricted to the latter. The officinal preparations of this description are distilled water, orange-peel, dill, fennel, caraway, lemon-peel, cassia, cinnamon, mint, peppermint, pennyroyal, pimento, and rose-waters.

The officinal *distilled spirits* are those of caraway, cinnamon, peppermint, pennyroyal, nutmeg, pimento, rosemary, or *Hungary water*, lavender, or *lavender water*, aniseed, juniper, compound spirit of horseradish, fœtid ammoniated alcohol, aromatic ammoniated alcohol, or *spirit of sal volatile*, and succinated spirit of ammonia, intended as a substitute for *eau de luce*.

The *volatile*, or *essential oils*, some of which are called *essences*, are either obtained by separating the superabundant oil that floats on the surface of many of the distilled waters, or by direct distillation from aromatic vegetable matters, for the sole purpose of procuring those oils. The following are officinal; volatile oils of caraway, fennel, juniper, savine, sassafras, lavender, chamomile, mint, peppermint, pennyroyal, pimento, origanum, aniseed, rosemary, rue, and turpentine. The oils of cinnamon, cloves, and nutmeg, are usually brought from Holland.

Mixture is a common name for all fluid compound medicines that are more or less opaque, and *emulsion* for those which contain oil in their composition. The officinal preparations of this kind are, almond mixture, milk, or emulsion, arabic emulsion, camphorated emulsion, camphorated mixture, mixture of ammoniac, emulsion or mixture of assafœtida, guaiac mixture, comp. mixture of iron or *myrrh mixture*, musk mixture, chalk mixture, and burnt hartshorn mixture.

The officinal preparations of alcohol are either rectifications of ardent spirit, as pure alcohol, or distillations from a mixture of alcohol and a mineral acid; as sulphuric ether with alcohol, compound spirit of sulphuric ether, nitric ether, and spirit of nitric or nitrous ether.

The officinal *preparations of sulphur* are, washed sulphur, precipitated sulphur, sulphuret of potash, water or solution of sulphuret of potash, hydrosulphuret of ammonia, sulphuret of iron, and water or solution of sulphuret of ammonia.

The officinal *acids*, or preparations of acids, are diluted sulphuric acid, nitrous acid, diluted nitrous or nitric acid, muriatic and diluted muriatic acid, oxymuriatic alkaline water, oxymuriatic water, distilled vinegar, acetic acid, or strong acetic acid, Benzoic acid, citric acid, and succinic acid.

The officinal *alkaline* preparations are, solution of potash, melted potash, potash with lime, sub-carbonate of potash, pure sub-carbonate of potash or *salt of tartar*, carbonate of potash, solution of sub-carbonate of potash, solution of supercarbonate of potash, acetate of potash, sulphate of potash, supersulphate of potash, sulphate of potash with sulphur, tartrate of potash, carbonate of soda, dried carbonate or subcarbonate of soda, solution of supercarbonate of soda, phosphate of soda, dried muriate of soda, sulphate of soda or *Glauber's salt*, tartrate of potash, and soda or *Rochelle salt*, water or liquor of ammonia, ammoniated alcohol, carbonate or subcarbonate of ammonia, water of carbonate of ammonia, liquor of hartshorn, and water of acetate of ammonia or *mindererus spirit*.

Of the earthy preparations, the following are officinal: Muriate of baryta, solution of muriate of baryta, lime, lime-water, prepared chalk, prepared oystershells, prepared egg-shells, precipitated chalk, muriate of lime, solution of muriate of lime, powder of burnt hartshorn, magnesia, carbonate of magnesia, and dried or burnt alum.

Of the officinal *metalline preparations*, one is derived from *silver*, the nitrate of silver or *lunar caustic*: Five are prepared from *copper*; prepared verdegris, compound solution of sulphate of copper, ammoniaret of copper, pills of ammoniaret of copper, and water of ammoniated copper; and fifteen from iron, purified iron filings, purified black oxide of iron, precipitated carbonate of iron, sulphate of iron, dried sulph. of iron, red oxide of iron, pills of iron with myrrh, tincture of muriate of iron, T. of mur. of iron with the red oxyde, muriate of ammonia and iron, ammoniated iron, tincture of ammoniated iron, tartar of iron, wine of iron, acetate of iron, tincture of acetate of iron, T. of acet. of iron with alcohol, and solution of alkaline iron. Three are derived from lead; acetate of lead, solution of subacetate of lead, and compound solution of subacetate of litharage: One from *tin*, powder of tin: And 17 from *mercury*, viz. purified quicksilver, acetate of mercury, muriate of mercury or *corrosive sublimate*, solution of muriate of mercury, submuriate of mercury or *calomel*, precipitated submuriate of mercury, white precipitated mercury, cinereous oxide of mercury, mercury with magnesia, mercury with chalk, red oxide of mercury, red oxide of mercury by nitric acid, yellow subsulphate of mercury or *turpeth mineral*, black sulphuret of mercury or *Æthiops mineral*, red sulphuret of mercury or *vermilion*, mercurial pills, and compound pills of submuriate of mercury. Eight preparations are derived from *zinc*; oxide of zinc, prepared calamine, prepared tutty, sulphate of zinc, solution of sulphate of zinc, compound solution of alum, solution of acetate of zinc, and tincture of acetate of zinc: Twelve from antimony; prepared sulphuret of antimony, sulphuretted oxide of antimony, vitrified oxide of antimony, vitrified oxide of antimony with wax, precipitated sulphuret of anti-

Pharmacy.

mony, brown antimoniated sulphur, muriate of antimony, nitro-muriatic oxide of antimony, oxide of antimony, oxide of antimony with phosphate of lime or *James's powder*, tartrate of antimony or *emetic tartar*, and wine or solution of tartrate of antimony or *antimonial wine*; and two from *arsenic*, sublimed oxide of arsenic and solution of arseniate of potash.

Of *cataplasms*, or poultices, only two are officinal, yeast cataplasm and mustard cataplasm, or sinapism.

Liniments are soft or semi-fluid unctuous remedies for external applications, chiefly as emollients or stimulants. The following are officinal,—prepared hog's lard, simple liniment, turpentine liniment, linim. of mercury.

Ointments are preparations of a similar nature, but of rather a firmer consistence. The officinial ointments are, simple ointment, spermaceti ointm., ointment of yellow wax, ointm. of white wax, elder ointm., resinous ointm., ointm. of elemi, comp. ointm. of elemi, tar ointm., ointm. of pitch, sulphur ointm., comp. sulphur ointm., ointm. of nitrous acid, ointm. of infusion of cantharides, ointm. of powder of cantharides, ointm. of black pepper, ointm. of white hellebore, ointm. of savine, ointm. of white oxide of lead, mercurial ointment, ointm. of white precipitated mercury, ointm. of red oxide of mercury, ointm. of nitrate of mercury, ointm. of subacetate of copper, zinc ointment, tutty ointm. and calamine ointment.

Cerates differ from ointments only in being of a still firmer consistence, so that they are not so easily melted by the heat of the skin, and are more proper for dressing wounds and ulcers. The officinal cerates are, simple cerate, spermaceti cer., cerate of resin, cer. of cantharides, savine cer., soap cerate, cer. of superacetate of lead, comp. cer. of lead, and calamine or *brown* cerate.

Plasters have the firmest consistence, are usually formed into rolls that they may be melted and spread with a heated spatula, and are generally intended to remain long on the body, to give support, or maintain a permanent stimulus. The following are officinal; wax plaster, comp. pitch plaster, cummin plaster, aromatic plaster, plast. of cantharides, calefacient plaster, comp. plast. of cantharides, lead or litharge plaster or *diachylon*, resinous or *adhesive* plaster, plast. of assafoetida, gum plast., galbanum plast., opium plast., soap plaster, mercurial plaster, plast. of ammoniac with mercury, plast. of red oxide of iron, or *strengthening plaster*, and plaster of frankincense.

After this full enumeration of the officinal compound remedies, we must refer, for an account of their composition, uses, and doses, or quantities, to Dr. Andrew Duncan's excellent Dispensatory.

Besides the forms of *powder*, *electuary*, *pill*, *infusion*, *decoction*, *emulsion*, *mixture*, *cataplasm*, *liniment*, *ointment*, and *plaster*, which are used also in extemporaneous prescription, the additional forms of bolus, linctus, julep, draught, gargle, lotion, embrocation, epithem, and lavement or clyster, are now confined exclusively to occasional prescription.

A *bolus* has the consistence of a stiff electuary, is made into a globular form, larger than a pill, but of a size convenient for swallowing, and contains a single dose. It is used chiefly for exhibiting volatile medicines, which could not properly be given in pills or mixture.

Therapeutics.

A *linctus* is a semi-fluid medicine, of an oily or a mucilaginous nature, intended chiefly to lubricate the throat in tickling coughs and sore throat. A *julep* is a clear fluid medicine, containing several doses. A *draught* is a small emulsion, mixture, or julep, containing a single dose. A *gargle* is a fluid medicine, employed for washing the mouth and throat when inflamed or ulcerated. A *lotion* is a fluid watery medicine, for bathing some part of the surface of the body. When employed to wash the eyes, it is usually called a *collyrium*. An *embrocation* is a fluid spirituous medicine, used as an external stimulant, in the way of bathing or rubbing. An *epithem* is a similar medicine, applied by means of cloths wetted with it. A *lavement*, vulgarly termed *clyster*, is a fluid medicine, containing from eight to sixteen ounces, capable of being injected into the bowels, and extremely useful in a great variety of cases, especially in costiveness, diarrhœa, colic, hysteria, tetanus, and suspended animation.

CHAP. III. THERAPEUTICS.

The consideration of remedies, according to their general action on the body, or its particular organs and systems, and their classification as founded on that consideration, form an important part of the principles of medicine, and properly follow the history and enumeration of the individual remedies.

Remedies act in one of three general modes on the animal body. Most of them operate by their influence on the living solids, especially on the nervous and muscular fibres. It has become fashionable to give these remedies the general name of *stimulants*; and, independent of all theory, it must be acknowledged that most of them deserve the appellation. Some are general stimulants, or increase the energy and activity of the whole system. Of these general stimulants, some act chiefly on the nervous fibres, and are called *stimulants* (by way of eminence,) *narcotics*, or *antispasmodics*. Others act chiefly on the muscular fibre, and produce a more permanent effect than the former; they are called *astringents* and *tonics*. Another division of exciting remedies is that of local stimulants, affecting more especially particular organs. Some of them act more immediately on the stomach, produce a contraction of that organ, and cause vomiting; they are called *emetics*. Others are supposed to excite the action of the bronchial vessels, generally from sympathy with the stomach, and thus increase the secretion of the mucous membrane of the lungs; they are therefore called *expectorants*. Another set of these remedies act either directly on the superficial vessels of the skin, promote perspiration, or produce sweat, and are called *diaphoretics*, or *sudorifics*. Others, again, exert their principal action on the salivary glands of the mouth, increase the flow of saliva, and are termed *sialagogues*. A few applied immediately to the mucous membrane of the nostrils excite the action of its vessels, increase their secretion, and commonly produce sneezing; these are denominated *errhines*. Again, many of them act immediately on the bowels, increase their muscular and often their vascular action, and evacuate their contents; they are called *cathartics*, or *purgatives*. Others act principally on the urinary organs, increase their excretion, and are termed *diu-*

retics; and a few applied immediately to the skin excite there heat and redness, generally raise the cuticle into a blister, thus producing an evacuation of serous fluid, and are called *epispastics*.

The second general mode in which remedies operate in the cure of disease is *mechanical*, by increasing the mass of fluids, and thus diminishing acrimony and allaying thirst, when they are called *diluents*, by softening the mucous membrane of the mouth and throat, and thus allaying irritation, properties which have given such remedies the name of *demulcents*; by softening and relaxing the skin and muscles, with what are called *emollients*; or by expelling parasitical animals from the intestines by means of *anthelmintics*.

The third mode of general action attributed to remedies is a *chemical* action, by which some called *refrigerants* are supposed to diminish morbid heat; others, termed *antacids*, correct or neutralise acid liquors collected in the stomach and bowels; a few, injected into the bladder, dissolve small calculous concretions, whence they are called *lithontriptics*; and some others, denominated *escharotics*, applied to the skin, or certain morbid excrescences, destroy their texture, and remove the latter. To these chemical remedies may be added some external *antiseptics*, or medicines which correct putrid odours, such as *charcoal* and *carbonic acid*.

Many other classifications of remedies have been contrived, but the above is adopted, as it appears one of the most popular as well as practical, and, on the whole, the least objectionable. We now proceed to examine the several heads a little more at large, and enumerate the principal remedies which belong to each.

General *stimulants*, sometimes called *cordials*, quicken the circulation, increase the heat of the body, invigorate for a time the whole system, and exhilarate the spirits. They are therefore useful in general debility, palsy, the low stage of malignant fevers, in most dropsical affections, and in convalescence from acute diseases. The principal stimulants are phosphorus, the preparations of ammonia, musk, tincture of cantharides, garlic, diluted alcohol in small doses, sulphuric ether and its modifications, snake-root, horse-raddish, balsam of Peru, cajeput oil, camphor, capsicum, cloves, cinnamon and the other foreign spices, balsam of copaiva, tincture of foxglove, the tinctures of guaicum, tincture of lavender, opium and its preparations, mustard seed, turpentines and oil of turpentine, wine in moderate quantities, most of the preparations of mercury, hot and vapour baths, and electricity.

Narcotics, or *anodynes*, diminish the sensibility of the nervous and the irritability of the muscular system, relieve pain, and, under favourable circumstances, tend to induce sleep. The principal are, opium and most of its preparations, belladonna, hemlock, foxglove, henbane, hops, stramonium, lactucarium, and tobacco. Their effects and uses are sufficiently illustrated by the account of opium in the first chapter.

The remedies called *antispasmodics* are those which tend to allay the inordinate or irregular actions of the muscular system, termed *convulsion* and *spasm*. Many general stimulants, especially the preparations of ammonia, musk, æther, camphor, wine, and electricity, and most of the narcotics, particularly opium, frequently act in that manner; and to these may be added castor, assafœtida, galbanum, valerian, oil of amber, ammoniaret of copper, and cold affusion, and in some instances the warm bath. The particular cases to which each of these remedies is suited can be determined only by a judicious practitioner.

Astringents are such substances as communicate to the tongue or palate a rough austere sensation, and, if vegetable matters, produce a precipitate when their solution is mixed with a solution of isinglass or other gelatine. They act on the living muscular fibre, whether of the muscles or vessels, and tend to contract it; whence they are of advantage in muscular debility and relaxation, in inordinate discharges from the exhalant vessels, especially purgings, and in passive hemorrhages. The principal astringents are bistort, catechu, logwood, kino, oak-bark, gall-nuts, tormentil root, alum, superacetate of lead, sulphuric acid, and sulphate of zinc. Opium also acts as an astringent, by its stimulant or antispasmodic effects.

Tonics, like astringents, appear to act chiefly on the muscular and vascular systems, especially of the stomach and bowels, and thus, by sympathy, on the whole body; but their action is slower and more permanent than that of the former. They are useful in weakness of the stomach and bowels, in general debility, and convalescence from acute diseases. Many of the vegetable tonics are simple bitters, and others are a compound of bitter and astringent principles. The chief tonics are wormwood, chamomile, Seville orange-peel, columbo, gentian, quassia, which are bitter tonics; cascarilla, cinchona, angustura, willow-bark, horse-chesnut, simarouba, which are astringent; hop, myrrh, port wine, sulphuric and nitric acids, oxide of arsenic, iron and its preparations, sulphates of copper and zinc, chalybeate mineral waters, and the cold bath.

Emetics not only excite vomiting, and thus relieve the stomach from an oppressive or dangerous load, but, by the sympathy of that organ with the rest of the body, produce many other beneficial effects, when judiciously administered. They tend to lower the pulse, promote perspiration, expectoration, and absorption, check inordinate discharges from the bowels, relieve some spasmodic affections, and promote the secretion of bile. Hence they are useful at the commencement of fevers, in catarrh, diarrhœa, and dysentery; in incipient sore throat, in cases of poison, in indigestion, in hooping cough and asthma, in some dropsies, and in jaundice. Ipecacuanha, tartrate of antimony, sulphate of zinc, and sulphate of copper, are the principal emetics.

Besides some emetics, as ipecacuanha and tartrate of antimony, which act as *expectorants*, when given in small doses to excite nausea, the following are ranked under this head: ammoniacum, assafœtida, myrrh, squill, tobacco, the vapour of ether, and the steam of warm water inhaled. Hence it is evident, that the general action of these remedies is not well understood; and, accordingly, medical writers are not agreed in their explanation of it. They are useful in all those affections of the throat and lungs which have just been noticed in the preceding paragraph, and also in pneumonic inflammation and pulmonary consumption.

Diaphoretics are useful in those cases where increased perspiration is found to relieve morbid symptoms, especially in the hot stage of fevers, in many inflammatory diseases, as catarrh, rheumatism, gout, dysentery, in indigestion, diarrhœa, some dropsies, and in cutaneous eruptions not accompanied with fever. In most cases, where the bowels are not lax, their administration should be preceded by cathartics, and in some by bleeding. They are of two kinds or degrees,—milder, comprehending the combinations of ammonia with vinegar or lemon-juice, infusion of sassafras, decoction of guaiacum and whey prepared with white wine or vinegar,—and stronger, generally called *sudorifics*, including guaiacum resin, camphor, ipecauanha combined with opium, many preparations of antimony, especially the tartrate combined with opium, hot and vapour baths, sulphureous mineral waters, used as a hot bath, and exercise or friction in a heated atmosphere. The use of the stronger diaphoretics should be accompanied with that of warm, diluting, but not stimulating liquors, and flannel should be worn next the skin.

The medicines more particularly termed *sialagogues*, including mastich, pellitory root, tobacco, and ginger, with some others, are employed chiefly as *masticatories*, to relieve toothach; but among them are also ranked the preparations of mercury, because they tend to excite salivation, and generally shew their influence on the system first by their effect on the mouth and gums.

Errhines, or snuffs, are used in several cases, particularly nervous headach, giddiness, toothach, earach, and slight dimness of sight. The principle errhines are asarabacca, herb mastich, tobacco, white hellebore, and the subsulphate of mercury.

Cathartics form an extensive and important class of remedies, beneficial in a great variety of morbid affections, as fevers, at their accession, and during the early stage, except when accompanied with bilious purging; most inflammatory affections, except those of the stomach and bowels, and even in the latter after bleeding and fomentation; in several febrile eruptions, especially measles and scarlet fever; in constipation and colic; in piles; in indigestion and hypochondriacal affections; in several spasmodic diseases, as tetanus, hysteria, chorea; in dropsies, and in jaundice. They are generally divided into *laxatives*, comprehending honey, olive oil, crystals of tartar, cassia pulp, figs, manna, senna and its electuary, prunes, tamarinds, sulphur, and soap; and *purgatives*, including phosphate of soda, tartrate of potash, tartrate of potash and soda, aloes, jalap, scammony, colocynth, elaterium, buckthorn, rhubarb, castor-oil, gamboge, calomel, sulphate of magnesia, sulphate of soda, and muriate of soda.

The use of *diuretics* is not confined to dropsical complaints, to which chiefly they are adapted, but is extended to calculus or gravel, some other affections of the urinary organs, indigestion, scrophula, and some affections of the skin. It should always be accompanied with the free use of diluting or mucilaginous liquors. The principal diuretics are tincture of cantharides, colchicum, foxglove, juniper and its spirit, squill, broom, turpentines, and oil of turpentine, crystals of tartar *in solution*, carbonate of potash, acetate of potash, nitre, spirit of nitrous ether, and carbonate of soda.

The principal *epispastics* are, cantharides and their preparations, garlic, mustard-seed in the form of poultice, and tartrate of antimony in solution or ointment. When the full effect of producing a blister is intended, the first are used; and the three others, but especially the last, are employed as external stimulants. Epispastics prove beneficial in many cases; in the low delirium of typhus fever and some febrile eruptions, and in an exhausted state of the vital energy, applied for a short time as stimulants. As blisters, cantharides are beneficial in all internal inflammations, except that of the kidneys, in headach, toothach, and earach, and hooping-cough. In most of these last cases, an ointment with tartrate of antimony in the proportion of one part of the salt to seven of lard, applied to or near the affected part repeatedly, so as to produce pustules, has been found highly useful.

Diluents are useful chiefly in febrile and inflammatory diseases. The principal are, water, toast-water, balm-tea, water-gruel, barley-water, lemonade, small beer, apple-tea, chicken-broth, milk-whey, and beef-tea.

The principal *demulcents* are, isinglass, spermaceti, gum-arabic, marshmallow, sweet almonds, starch, liquorice-root and extract, pearl-barley, Iceland liverwort, lintseed, olive oil, and gum-dragant.

The oily demulcents applied externally act as *emollients*, and to them may be added hog's-lard, butter, suet, and bee's-wax softened with oil or lard; but the principal emollients are heat and moisture combined in the warm bath, fomentations and poultices, the uses of which have been already mentioned.

Anthelmintics are either strong purgatives, as aloes, gamboge, foetid hellebore, jalap, senna, scammony, and calomel, which expel worms by increasing the peristaltic motion of the bowels;—tonics, as iron, chamomile, and tansy, which act by strengthening the intestinal canal, and favour the animals' expulsion, or such substances as destroy the worms by abraision, as cowhage and powder of tin,—poison them, as olive oil, and oil of turpentine, and perhaps some others,—or dislodge them by their strong odour, as garlic, assafoetida, camphor, ammonia, and rue.

The *antacids*, sometimes called *absorbents*, consist chiefly of the alkalies and alkaline earths, as solutions of ammonia, prepared egg-shells, crab's-claws, oyster-shells, carbonate of potash, carbonate of soda, lime-water, prepared chalk, magnesia and its carbonate. They act by combining with the acid liquors formed in the stomach and bowels during imperfect digestion, and thus produce neutral salts, which sometimes act as purgatives, and sometimes as astringents, according as the antacid used be magnesia or lime. Sulphuric and nitric acids also belong to this head, as, by strengthening the stomach and checking fermentation, they prevent the formation of acid. Antacids are used in those distressing symptoms of indigestion, heart-burn, and water-brash, and the preparations of lime are employed to check purging connected with acidity.

How far *refrigerants* may be regarded as chemical remedies is uncertain. The direct application of cold, in the form of cold drinks, cold affusion, ice, and snow, in fever, external inflammation, and inflammatory affections of the head and neck, seems to act in that way; but the cooling effect of acids, acid fruits, nitre, and some other salts, appears rather to depend on the laws of vitality.

In the definition already given of *lithontriptics*, the term has been restricted to those remedies which can be applied directly to the calculous concretion, such as diluted mineral acids, and weak solutions of caustic alkali. But many other substances, taken internally, are included in this division, though there is little probability of their reaching the seat of the disease in a state capable of acting on the calculus. Soda, soap, spirit of nitrous ether, oil of turpentine, and whortleberry leaves, are of that description.

Some *escharotics*, as fused potash, potash with lime, nitric acid, and nitrate of silver, and the actual cautery, undoubtedly act chemically, by destroying the part to which they are applied; but some others, as sulphate of copper, oxide of arsenic, dried alum, and nitric oxide of mercury, seem to effect their purpose by stimulating the absorbent vessels, and thus removing the excrescence.

Antiseptics is a term given to many remedies, some of which, as charcoal, carbonic acid in the state of gas or solution, nitric acid, and chlorine or oxymuriatic acid in the state of gas, appear to act chemically in correcting putrid odours from the gums, the bowels, and ill-conditioned ulcers, and purifying a contagious atmosphere; but other remedies usually classed under this head, as vinegar, sulphuric acid, camphor, Peruvian bark, myrrh, and opium, act as tonics or stimulants, and enable the system to resist decomposition, or throw off mortified parts.

Remedies may be conveniently divided into *internal* and *external*, the former term comprehending all that are taken into the stomach, the latter such as are applied to the skin, taken into the mouth as washes and gargles, or injected into the bowels as clysters. Of internal remedies, it is unnecessary to say more in this treatise; but the external application of medicines is so important, and has been lately so much extended, that it is proper to make a few remarks on the subject.

When the extent of the skin and its continuations into the mouth, the ears, and the bowels, not to mention other parts, is attentively considered, it will not be surprising that direct applications to such a membrane should be capable of producing the most beneficial or most injurious effects. In fact, of all the classes of remedies above enumerated, very few do not contain substances which may be applied through the medium of the skin. With respect to general stimulants, this assertion has been already sufficiently proved; and in what are called local stimulants, it is scarcely less true. Vomiting may be produced by applying a poultice of tobacco to the pit of the stomach; expectoration by inhaling stimulating vapours; perspiration by the external means mentioned under diaphoretics; and salivation by mercurial ointment. Purging is often brought on by exposing the body to cold moist air, and obstinate constipation has been removed by dashing cold water over the belly,—without enlarging on the benefits derived from lavements and suppositories. Diaresis is very commonly excited by the cold bath, by rubbing the belly with a liniment of oil of turpentine, or by turpentine lavements. Narcotics and antisposmadics may, in many cases, be administered externally by friction, or by lavements, and the cold bath is one of the most powerful tonics. The warm bath acts as a diluent, as well as emollient, and even thirst may be allayed by wetting the surface of the body. Thus it appears, that where the internal exhibition of medicines is either unpleasant to the patient, or impracticable from a defect or obstruction in the organs of swallowing, much may be done to give relief by external means.

In the account of simple remedies in the first chapter of this treatise, the doses of particular medicines have been stated as proper for an adult; but it is necessary to observe that these doses must be regulated according to the sex, constitution, and age of the patient. Females and old persons of both sexes generally require a smaller dose than males and persons of middle age; and patients who have naturally a robust constitution, or are accustomed to a laborious way of life, require a larger dose of most medicines than such as are delicate or of sedentary habits. From the average dose for an adult, it is in general easy to calculate what is proper for a child of any given age, or for a patient advanced in years, by attending to the following rules:—Supposing the average dose for an adult be fixed at a drachm or 60 grains of Peruvian bark: a child of seven months will require about a twelfth, or five grains; one of 14 months, one-sixth or 10 grains; one between two and three years, one-fifth or 12 grains; one between three and five years, one-fourth or 15 grains; between five and seven years, a third or 20 grains; between 7 and 14 years, one-half or 30 grains; and a youth between 14 and 21, two-thirds or 40 grains. Again, when a person has reached his 63d year, the dose should be diminished one-twelfth, or reduced to 55 grains; at 77 years, he will require still less, or about 50 grains; and if he reach 100 years, he will require no more than a child of 14 years, or 40 grains. It must indeed be acknowledged that many exceptions to these general rules present themselves in practice; and where active or hazardous remedies are used, the doses in any particular case should be fixed by the medical attendant.

The doses of strong fluid medicines, as volatile oils and concentrated tinctures, are commonly regulated by drops, and, in the case of the former, this method cannot be avoided; but in exhibiting tinctures it is precarious and uncertain, as the size of the drop, and consequently the quantity of the medicine, depends on the mouth of the phial from which the drops fall. It is better to have the medicine so diluted that it may be measured by a graduated glass tube, or by tea-spoons made to hold exactly a drachm or half a drachm; and such measures and spoons, with a box of scales and troy-weights, should always be ready in a family where domestic medicines are employed.

INDEX.

A

Acetous acid, 720
Acids, officinal, 732
Affusion, cold, 727
Air, pure, 729
Alcohol, 720
  preparations of, 732
Aloes, 723
Alum, 728
Amber, 727
Ammonia, preparations of, 732
Ammoniacum, 721
Angustura, 722
Anise, 723
Anodynes, 734
Apparatus of Pharmacy, 729
Antacids, 735
Anthelmintics, 735
Antimony, 728
  preparations of, 732
Antiseptics, 736
Antispasmodics, 734
Apple, bitter, 726
Arsenic, 728
  preparations of, 733
Assafœtida, 723
Astringents, 734

B

Balsam of Tolu, 724
Barley, 722
Baryta, Salts of, 728
Baths, different kinds of, 727
Bolus, 733
Borax, 729
Buckthorn, 723

C

Cajeput oil, 725
Camphor, 724
Cantharides, 720
Capsicum, 722
Carbonic Acid, 729
Cardamom, 721
Carrot, 723
Cassia, 724
Castor, 719
Castor oil, 726
Cataplasms, 733
Catechu, 729
Cathartics, 735
Cerates, 733
Chalk, 728
Chamomile, 726
Charcoal, 720
Chesnut, Horse, 724
Cinchona bark, 722
Cinnamon, 724
Cloves, 724
Cochineal, 720
Columbo root, 721
Coral, red, 720
Copper, 727
  preparation of 732
Currants, 723

D

Decoctions, 731
Demulcents, 735
Diaphoretics, ib.
Diluents, 735
Diuretics, ib.
Doses, regulation of, 733

E

Earthy preparations, 732
Electricity, 729
Electuaries, 730
Emetics, 734
Emollients, 735
Emulsions, 731
Epispastics, 735
Errhines, ib.
Escharotics, 736
Exercise, 729
Expectorants, 734
Extracts, 731

F

Fern, male, 727
Foxglove, 725
Friction, 729

G

Galbanum, 723
Gall-nuts, 726
Galvanism, 729
Gamboge, ib.
Garlic, 723
Gentian, ib.
Ginger, 721
Guaiacum, 724

H

Hartshorn, 720
Heat, 729
Hellebore, white, 727
Hemlock, 725
Henbane, 722
Honey, 720
Honeys, medicated, 731
Horse-radish, 725

I

Jalap, 722
Iceland moss, 727
Infusions, 731
Ipecacuanha, 723
Iron, 728
  preparations of, 732
Isinglass, 720

L

Lactucarium, 572
Lavements, 733
Lead, 728
  preparations of, 732
Lemon, 725
Lettuce, ib.
Light, 729
Linctus, 733
Liniments, ib.
Lithontriptics, 736
Lotions, 733
Lozenges, 731

M

Mace, 726
Manna, 729
Marble, 728
Materia Medica, objects of, 719
  division of, ib.
  writers on, ib.
Mercury, 728
  preparations of, 732
Mezereon, 724
Mixtures, 732
Mucilages, 731
Muriate of ammonia, 719
Musk, 720
Mustard, 725
Myrrh, 721

N

Narcotics, 734
Nutmeg, 726

O

Oats, 722
Oils, expressed, 731
  volatile, 732
Oily preparations, 731
Ointments, 733
Olive oil, 721
Opium, 725
Orange, Seville, ib.

P

Palm-oil, 727
Pellitory of Spain, 726
Pepper, black and white, 721
Peruvian bark, 722
Pharmacology, 719
Pharmacy, 729
Phosphorus, 719
Pills, 731
Plasters, 733
Poppy, 725
Potash, 721
  preparations of, 732
Powders, 730
Processes of Pharmacy, 730
Purgatives, 735

Q

Quassia, 724

R

Refrigerants, 736
Remedies from the animal kingdom, 719
  from the vegetable kingdom, 720
  from the mineral kingdom, 727
  forms of, 730
  arrangement of, 735
Rhubarb, 724
Rosemary, 721
Rue, 724

S

Sage, 721
Sassafras, 724
Scammony, 722
Sea salt, 729
Senna, 724
Sialagogues, 735
Silver, 727
  preparation of, 732
Snake root, 726
Soap, 720
Soda, 728

Index.

Soda, preparations of, 732
Spermaceti, 720
Spirits, distilled, 732
Sponge, 720
Squill, 723
Starch, 722
Stimulants, 734
Sugar, 721
Sulphate of magnesia, 728
Sulphur, 727
 preparations of, 732
Sulphuric acid, 728
Syrups, 731

T

Tansy, 726
Tartar, 723
Therapeutics, 733
Tin, 728
 preparation of, 732
Tinctures, 731
Tobacco, 722
Tonics, 734

V

Valerian, 721
Vinegar, 720
Vinegars, medicated, 731

W

Water, 727
Waters, mineral, ib.
 distilled, 732
Wax, 720
Wine, 723
Wines, medicated, 731
Wormwood, 726

Z

Zinc, 728
 preparations of, 732

Material
‖
Materialists

MATERIAL applies to matter in opposition to what is spiritual; as material world, material bodies, &c.

MATERIALISTS, an ancient sect, who, following the maxim *out of nothing nothing can arise*, supposed an internal matter on which they imagined God wrought in the creation of the world. They were vigorously opposed by Tertullian in his treatise against Hermogenes. The appellation has likewise been applied to such as maintain that the principle of thought and perception is the result of mere corporeal organization.

MATHEMATICAL INSTRUMENTS, such as are used in drawing and measuring mathematical lines and figures, or in solving problems, are commonly secured in portable cases, which are either made vertical or horizontal; the last of which is preferable, because the points, in this way, are better preserved, which is an object of no small importance, as the excellence of the compasses and drawing-pens depend much on the delicacy of their points or terminations. It is scarcely necessary to observe, that the whole of these instruments ought to be of the best finish and materials, as the most trivial defect cannot fail to render the whole of the mathematician's operations precarious and abortive. A common case of instruments consists of a pair of plain and a pair of drawing compasses, with a drawing, a dotting, and a steel pen, a port-crayon, and a pointer, also a plain scale, a protractor, a black-lead pencil, a parallel ruler, and a sector.

The *plain compasses* are employed in drawing obscure lines through any given point, in measuring the distances between two points and applying it to the scale, or in measuring one line with another; also in describing circles, intersecting arcs, laying off or measuring angles by a scale of chords.

The *drawing compasses* have a triangular socket in one of the legs, in which may be fastened, by means of a screw, as required, a steel point, port-crayon or pencil, a steel pen for drawing lines or circles with ink, or an indented wheel for drawing dotted lines or circles.

The *protractor* is made of ivory, steel, silver, or of brass, in the form of a semicircle, divided into 180 degrees, and numbered each way, or, what is preferable, in the form of a right-angled parallelogram. The use of this instrument is to measure an angle, or construct one of any given dimensions, or to erect perpendiculars.

Mathematical Instruments.

The *plain scale* contains a line of six inches, a line of 50 equal parts, and a diagonal scale, all on one side, and is used for laying down and measuring distances. On the other side is a line of chords marked by the letter C, with seven decimal scales of different dimensions, in which each inch is divided into ten equal parts, for giving dimensions, either in inches or in decimal or tenth parts of an inch; so that, by these lines, any given decimal of a foot may be reduced to inches, or any number of inches to the decimal foot.

The *sector* is made to fold in the middle, and consists of two flat legs, and, when open, measures one foot, each inch being numbered and divided into tenth parts, called lines. At the edge is another scale, dividing the feet into ten equal parts, marked 10, 20, 30, &c. because each tenth part of the feet is subdivided again into other ten, thus dividing the 12 inches into 100 equal parts. On this instrument are marked both single and double lines, divided decimally and centesimally; also logarithmic sines and tangents, a line of chords, sines, tangents, rhumbs, latitude, hours, longitude, inclination of meridians, and logarithmic versed sines. These are on one leg only; but the scales of inches, decimals, log. numbers, log. sines, log. versed sines, and log. tangents, are on both, and, when used, require the sector to be extended. The double lines run obliquely from the centre, and each is laid once on each leg.

The *parallel ruler*, used for drawing lines exactly parallel to each other, consists of two slips moving upon four pivots, one at each end of two metal plates, by which the slips are always kept at a perfect parallel. This ruler has also been improved by a third piece, so connected, that the two exterior rulers move not only parallel, but likewise opposite to one another; which certainly is a very great improvement, as it extends the scope of this instrument by giving a third parallel.

The best account of the nature and uses of these instruments will be found in Robertson's *Treatise of Mathematical Instruments*, and Martin's *Principles of Perspective*.

MATHEMATICAL SECT, one of the two sects of philosophers in the 17th century, the other being metaphysical. The mathematical philosophers confined themselves to observation and experiment in their researches; and this method of philosophizing has been happily illustrated by Lord Bacon, as well as by Boyle, Barrow, Newton, Wallis, Locke, and others.

MATHEMATICS.

Definition. MATHEMATICS, a word derived from the Greek, and originally signifying any kind of learning or discipline, is applied, by way of distinction and eminence, to the science which has *quantity and its relations* for its objects; or, as it has been defined, that science which contemplates whatever is capable of being numbered or measured. The epithet *pure,* and sometimes *simple,* is used, when the science is signified which relates to quantity in the abstract, that is, without relation to matter; and, on the other hand, mathematics are said to be *mixed,* when physical properties are taken into account. The two great branches of the first are *arithmetic* and *geometry,*—those sciences which treat of *number* and *figured space*; *optics* and *hydrostatics* are examples of the latter. It is to the superiority and abstract nature of the ideas constituting the foundation of the former, with which alone we are now concerned, that we are indebted for that accuracy of procedure, that certainty of result, and that extent of power, which, by displaying the greatest energies and capabilities of human thought, have secured to mathematics the highest rank in the scale of natural knowledge. In the prosecution of this science, as confined to number and figured space, the mind, by being freed from the necessity of regarding any of the properties of matter, and, therefore, from the consideration of any external object, seems exempted from all the infirmity which besets it in other pursuits, and, elevated above the sources of error, is at liberty not only to explore a vast world already in existence, but, as if this were too small a sphere for its faculties, to create a world of its own, and subject the very elements of order, proportion, design, causation, and consequence, to its own will. What are the principles of a system—so infallible in progress, so resistless in agency, so unlimited in intelligence, and yet so unaided by experience, by the intimations of sense and the authority of observation, that it rather resembles the intuition and the all-pervading supremacy of the Great Artificer, than befits the character and the destinies of man? We commence with those which relate to

NUMBER.

There is probably an original faculty in the human mind on which the idea of number depends; for, certainly, the conception of it is so early in occurrence, and so general among mankind, independently of all education, that we are almost necessarily induced to conclude it to be the product of a native power. Any of the senses may prove the means of exciting it. Thus, we cannot look on the various objects around us, hear the songs of birds, touch the members of our own bodies, smell the flowers of the field, or taste the fruits of the earth, without entertaining the ideas of one and of many. These ideas are originally connected with those of the properties or qualities which have called them into being. But, in a short time, the mind learns to discriminate between them; and then, number, in the abstract, becomes an object on which the reasoning faculties may be exercised. Besides its capability of being represented or signified, like any other conception of our minds, by arbitrary or conventional language, it possesses certain qualities or affections, each of which may merit consideration. Number.

Numbers may be increased or diminished. To the number denoted by the name *one,* another may be added; with this compound another may be conjoined; and so on indefinitely. From any of the compounds, or masses, so formed, *one* may be taken away, another from what remains, and so on till one is left alone; and even this *one* can be conceived, from examples of such division presented to us in nature, to be broken or reduced into parts, on which the same operations can be performed as on the entire numbers themselves. It would early be found convenient, in practising these operations, and, indeed, in the simple enunciation of the degrees between *one* and *several,* to adopt peculiar names or characters, in order to specify the observed differences. These would obviate the necessity of repeating *one* a certain number of times; and, by presenting signs which had invariable meanings, would facilitate the communication of correct knowledge, and abridge the labour of calculation. Besides being capable of increase, diminution, and representation, numbers might be compared together in a variety of ways, as two at a time, three or more together; and various discoveries touching their equality or their inequality, and the degrees of the latter, would be the result. The relations thus brought to light may be denoted by particular signs, as well as the numbers themselves; and so, too, may the operations to which numbers are subjected. And thus we have, in few words, stated the elementary principles of a science which, in course of time, and by much ingenuity and patience, has been made justly to claim the honours of one of the proudest and most imperishable monuments of human intellect.

To represent *number,* as to represent other objects of our thoughts, we may adopt various systems of signs, both palpable and visible, not one of which can have any other meaning than that which they who use it have assigned to it. One great advantage of any system, is the extent to which it is known. The letters of an established alphabet present such an example in a very high degree. It might be possible to adapt a particular character to every particular number, from one up to the highest of which we can form any conception; but it will be evident, on a moment's reflection, that the prodigious mass of characters so adapted would set the best memory at defiance, and that, to insure accuracy in the application of them, perpetual reference would be needed to some table in which they are recorded, in order to effect the most common calculations. In place of so clumsy a process, recourse may be had to a few characters, which, by combination and changes in relative position, as in the case of written language, will answer all the purposes of addition, diminution, and proportion. Two, three, four, or more characters, may be used in this manner; and thus we may have a *binary*, *ternary*, or *quaternary* arithmetic. But besides the peculiar qualities arising from the principles of numbers, there will be a material advantage in employing a number sufficiently great to admit of many combinations, and yet not so great as to be with difficulty remembered. Any one system cannot be supposed to have every convenience, and occasions may present in which it would be expedient to take the aid of several systems, or of a system which is not found generally useful. That which is styled *denary*, from its having nine distinct characters, and what is called the *cypher*, *zero*, or sometimes *nothing*, making in all therefore *ten*, as the word denotes, is now universally received, and incorporated into almost every known language; whence the fair presumption that it is founded on a common and generally recognized principle; and such a principle is to be discovered in the early practised, and we may say naturally-suggested calculation, by the fingers of both hands.

The nine distinct characters or *digits*, and their English names, are respectively,

1	2	3	4	5	6	7	8	9
one,	*two*,	*three*,	*four*,	*five*,	*six*,	*seven*,	*eight*,	*nine*,

which advance throughout by the regular addition of one. To proceed higher, by the same addition, a single step, we introduce the cypher or zero, marked 0, to the right of the first digit, and so constitute the compound character, denominated *ten*, and written thus 10; after which, still advancing in the same manner, we substitute 1, 2, 3, 4, 5, 6, 7, 8, 9, in place of the cypher, the first digit remaining, and so

11 12 13
we obtain the compounds *eleven*, *twelve*, *thirteen*,
14 15 16 17 18 19
fourteen, *fifteen*, *sixteen*, *seventeen*, *eighteen*, *nineteen*,

in both the signs and the names of which we may observe that the root *ten* is constantly retained. Accordingly, *eleven*, *twelve*, really signify *one*, *two*, and something left, namely *ten*; as *thirteen*, *fourteen*, &c. signify *three*, *four*, &c. conjoined with *ten*. Now, it is very obvious, that, having again exhausted the nine distinct characters, we may equally well proceed on the same principle, if we mean to advance still higher, by merely changing the first digit into 2, and adding the cypher. Thus 20, named *twenty*, *two tens*, or *twice ten*. Then substituting, as before, the series of digits for the cypher, we have progressively 21, that is *twenty* and *one*, or *twenty-one*, 22 *twenty-two*, &c. up to 29, *twenty-nine*; when, pursuing the same course, we may change the first digit into 3, and continue advancing, substituting, and changing, as before, till the digit on the left hand become 9, and that on the right the same, forming 99, *ninety-nine*, that is *nine tens and nine*. Here, again, we may avail ourselves of the use of the cypher, which, though it have no value of its own, has the power, as we have seen, of changing the value of the significant digits, or increasing it tenfold. Thus, then, as 9 with the addition of one becomes 10, in which 1, by means of the zero, signifies ten times more than it signifies when standing alone, so 99, with the addition of 1, becomes 100, in which case 1 has ten times the value it had when occupying the second place, and signifies *ten times ten*, or a *hundred*. We can now therefore represent every number from one to a hundred; and, it is quite obvious, that in order to go higher by *hundreds*, as far as *nine hundred*, we have only to change the digit which occupies the first place on the left hand; and, again, to go higher by *tens*, we have only to change the digit which occupies the second place; and to go higher by *units*, we must change the first digit on the right. Accordingly, *nine hundred* will be represented thus, 900, as *nine tens* or *ninety* were 90, and *nine units*, or simply *nine*, 9. Arranging all these together, we have 999, that is *nine hundred* and *ninety-nine*. To represent any number greater than this, we have just to employ the same principle, namely, the introduction of another digit, occupying a position still more to the left, and the value of which is precisely *ten times* that of the digit immediately on its right, a *hundred times* that of the next or the second digit, and *ten hundred times*, or as it is called a *thousand times*, that of the first digit, or the one which denotes *unity*. It follows universally, that as we make any digit approach towards the left, or augment the number of digits, we increase by *tens*, *hundreds*, and *thousands*; as on the other, to diminish their number, or approach towards the right, is to decrease in the same proportion. The positions of the digits, therefore, indicate their rank or order, and their own value specifies how many of that rank or order are to be taken. The position of a digit may be maintained by a zero or cypher, which can represent any rank or order, and which, as it has no value, or signifies nothing, denotes that there are no units of that rank or order. Thus 7408 expresses *seven thousands*, *four hundreds*, *no tens*, and *eight units*, or briefly *seven thousand four hundred and eight*, the position of *tens* being occupied by a cypher. Again, 5036 represents *five thousand*, *no hundreds*, *three tens*, and *six units*, that is briefly *five thousand and thirty six*, the place of *hundreds* being occupied by a cypher. In the same manner we can represent any number however high.

When the digits become very numerous, it is convenient, for the sake of discrimination and enunciation, to divide or distinguish them by *periods*, or to conceive them forming *series*, each of which consists of a certain number of digits. The number chosen for the purpose is entirely arbitrary; but common usage has established three for the numbers of a period, commencing with the digit or the zero which occupies the rank of units, as exemplified in the following enumeration of digits, and the names of their respective ranks; in which it will be observed, that the first digit of every triple period, reckoning from the right, is that of *units*, the second that of *tens*, and the third that of *hundreds*, in their respective ranks, under the denominations of *units*, *thousands*, *millions*, &c.

5th Period.	4th Period.	3d Period.	2d Period.	1st Period.
6 7 9,	4 9 6,	1 2 5,	5 4 8,	3 6 4,
hundreds tens units	hundreds tens units	hundreds tens units	hundreds tens units	hundreds tens units
trillions.	billions.	millions.	thousands.	units.

In order to enunciate this, or any other assemblage of numbers previously so distinguished, or, as is usual in practice, divided into triplets by commas or bars, we commence at the left, specify every digit in every period or triplet, give its degree in that period as if the period stood alone, and, at the end of every period, mention its name, according to its arrangement in the series; or, in other words, we read in every period, beginning at the left, the *hundreds*, *tens*, and *units* contained in it, and then state its denomination. Thus, in the present instance, we say, *six hundred and seventy-nine* TRILLIONS, *four hundred and ninety six* BILLIONS, *one hundred and twenty-five* MILLIONS, *five hundred and forty-eight* THOUSANDS, *three hundred and sixty-four* (UNITS understood, or the names of the things being mentioned to which the numbers relate.) From TRILLIONS we may advance, in the same way, to QUADRILLIONS, or *millions four times repeated*, QUINTILLIONS, SEXTILLIONS, SEPTILLIONS, OCTILLIONS, NONILLIONS, DECILLIONS, &c. &c. without limit.

Thus far of *notation* and *numeration* in the case of *integer* or whole *numbers*, that is, such as consist of *entire quantities*, or quantities not divided into parts less than an unit. Quantities may also be considered as divided into parts less than an unit; and thus we speak of a *half*, a *third part*, a *fourth* or *fifth part*, and for these parts or *fractions* we must have adequate expressions. We may denote them by two numbers, placed one over a line, and the other under it; thus, $\frac{1}{2}$, $\frac{2}{3}$, $\frac{5}{4}$, $\frac{4}{3}$, &c.; the number under the line, called the *denominator*, indicating into how many equal parts the unit or entire number is supposed to be broken; and the number above the line, called the *numerator*, signifying how many of those equal parts are to be taken, or are contained in the fraction. These constitute vulgar fractions.

As the parts of numbers, again, are less than the numbers, or fractions are less than units, we may, in all cases of fractions, the denominators of which are 10, 100, 1000, 10,000, &c., express their value by placing them after the series of whole numbers, that is, to the right, a comma or other mark being used to distinguish the point at which the whole numbers terminate and the fractions commence. For, as in the numeration already explained, the digits increased in value ten times at each successive remove towards the left of the place of units, it is evident that they decrease in the same proportion at every successive remove towards the right, and that, proceeding onwards beyond the point at which the whole numbers terminate, a new series of units may be formed in *subdecuple* order. Thus, then, the decimal parts being always taken in relation to the principal unit, the first digit after the comma or point of distinction will express *tenths*, the second *hundredths*, the third *thousandths*, &c. taken as often as the digits signify, and to be read in the same way as whole numbers, only calling them so many parts of 10, 100, 1000, &c. For example, 256.537 denotes *two hundred and fifty-six* whole numbers, and, in addition, *five-tenths three-hundredths* and *seven-thousandths* of a unit; which last might be expressed thus, $\frac{537}{1000}$. In the case of these fractions, called *decimal*, the addition of a cypher or zero to the right of the decimal occasions no change of its value, but if placed on the left decreases the value tenfold; precisely as in the case of whole numbers, on the contrary, it makes no alteration if placed on the left, but increases the value tenfold when added to the right. Thus, .3 and .30 and .300, in decimals, are of equal value, namely, $\frac{3}{10}$; but .03 signifies $\frac{3}{100}$, and .003 represents $\frac{3}{1000}$.

The decimal notation is very convenient for several purposes, and has been extensively employed, of late years, by the French.

A notation called *duodecimal* is found useful on some occasions, especially in certain measurements of work, and is so named because every superior degree contains 12 of its next inferior; and another notation, denominated *sexagenary* or *sexagesimal*, is adopted in the division of time and of a circle. Other notations are now rarely used.

We now proceed to give certain definitions, and specify the meaning of certain signs of frequent occurrence in the science of numbers.

Definition 1.—A *whole* number is one which consists of an entire unit, without fractions; and a *mixed* number is one in which a fraction is conjoined with a whole number.

2. An *even* number is one which can be divided into two equal whole numbers; and an *odd* number is one which cannot be divided into two equal whole numbers.

3. One number is said to be a multiple of another, which may be repeated in it so many times without a remainder. Thus, 8 is a multiple of 2; for it contains 2 four times repeated, without a remainder.

4. A *prime* number is one which can be divided by itself only, or by a unit, without a remainder; and numbers are *prime* to each other when only an unit divides or measures both of them without remainder.

5. The *sum* of two or more numbers is the aggregate quantity arising from their being collected or put together. Thus, 8 is the sum of 2, 2, 2, 2, added or combined into one. The operation by which sums are obtained is accordingly called *addition*.

6. The *difference* of two or more numbers is that quantity which remains after the less is taken from the greater. Thus, 6 is the difference of or between 8 and 2; for if 2, which is the less, be taken from 8, which is the greater, there will remain that number. The operation by which differences are discovered is accordingly called *subtraction*.

7. The character $+$ denominated *plus*, or *more*, is used to denote that the numbers between which it is placed are to be added together. Thus, $2 + 2 + 2 + 2$ signifies the addition of these numbers into one *sum*, namely, 8, as above.

8. The character $-$, denominated *minus*, or *less*,

denotes that the number which follows it is subtracted from the number which precedes it, or that the *difference* between them is to be taken. Thus, $8-2$ signifies that 8 is to be diminished by the removal of 2.

9. The character $=$, denominated *equal to*, or the sign of equality, signifies that the number, numbers, or results of the operations on the numbers, which are on one side of it, are equal to the number, numbers, or results of the operations on the numbers which are on the other. Thus, $2+2+2=8-2$; for $2+2+2$, or 2 added together three times, form a sum equal to 6, and if 2 be taken away from 8 there will remain 6. Therefore, we may say, $2+2+2=8-2=6$.

10. It is self-evident that $2+2+2$ is just 2 taken three times, and that 6, the sum, is a multiple of 2, in the same way as 8 is, according to the definition of a *multiple*; for 6 contains 2 a certain number of times, namely three, as 8 does four times, without a remainder. There may be different multiples, therefore, of the same number. Now, in place of writing down 2 three or four times, the sign of addition, or plus, that is $+$, being interposed, we might more conveniently express the same thing by employing a character to signify taking the multiple of a number, and specifying the multiple that is to be taken. The mark $\times$ is used for the purpose, and denotes *multiplied into or by*, the number of which a multiple is to be taken, and which is called the *multiplicand*, being placed on one side of it, and the number which indicates how often it is to be taken, and which is called the *multiplier*, being placed on the other. Thus, 2×3 is equivalent to $2+2+2$, or $=6$; and $2\times 4=8$. It obviously makes no difference on which side of the character we place either of the numbers, for $4\times 2=2\times 4$. In all cases, then, in which it is required to add a certain number to itself so many times, we may avail ourselves of this mode of expressing what is intended, and simply state on either side of the sign the number to be added together, and, on the other, the digit or digits indicating how many times it is to be added. Thus, $3917\times 54=54\times 3917=3917$ added together 54 times, or 54 added together 3917 times. The operation thus indicated, is called *multiplication*, and is, we may perceive, essentially the same as addition. The result of it, or the quantity obtained by the multiplication of the numbers, is called the *product*.

11. It would be equally convenient to have a character to express the continued diminution of one number by another, or that it is required to state how many times one number is a multiple of another, with or without remainder. This we have in the mark $\div$, signifying *divided by*, or by placing one of the numbers called the *dividend*, from which the continued abstraction is to be made, above a line, and the other number, called the *divisor*, that by which it is to be divided, as often as possible, under the line. Thus, $8\div 2$, or $\frac{8}{2}$, signifies that 8 is to have 2 taken from it as often as it can, namely, four times, that is $\frac{8}{2}=4$. The operation is called *division*, and is essentially the same as subtraction. The result of it, or the number of times which it is found the divisor is contained in the dividend, is called the *quotient*; and this, it is very obvious, from the nature of the operation, ought, when multiplied by the divisor, with the addition of the remainder, (if any,) to be equal to the dividend.

12. The character :, or ::, is used to denote the *proportion* or *ratio* that one number or magnitude bears to another, considered merely in respect of quantity, or signifies the mutual comparison of quantities of a like kind so far as concerns their quantity only.

We have now seen that any number may be introduced into a calculation in two ways, namely, as one to be added, and as one to be taken away, that is, either as an *increment*, or as a *decrement*; and thus the system of digits is one mode of representing and reasoning concerning quantity, which, being made up of parts, is capable of augmentation and diminution. But it is not the only mode, nor the most general mode that can be conceived. It is not the only mode; for it is obvious that lines drawn on paper, or any way else made either apparent to the eye or cognizable by the sense of touch,—for example, rods and cords,—may, from being also capable of increase and decrease, serve some of the purposes of calculations on quantity; and that it is not the most general will be easily perceived, on reflecting that each digit represents only a certain *number*, or has a determined individual value, and that, therefore, the digits can be compared together only in relation to the numbers for which they stand; whereas, it is quite conceivable, that characters or signs might be used to denote not only certain particular numbers, but numbers of any amount or degree; and not merely numbers, but magnitudes or quantities in general, that is, without particular restriction either in degree or in kind. The digit 6, for example, represents a special number, one of the properties of which is, that it contains 2 three times; or that it is divisible into two parts, each of which is equal to the number denoted by 3; or that it is equal to the amount of 1 taken six times; or that, if taken from the number denoted by 8, the number denoted by 2 will remain; and in all languages where these digits are used, the same value is assigned to them, whatever may be the things or objects to which they may at any time be applied. But, in place of the digits thus restricted in meaning, we may employ characters which shall stand not only for particular numbers when we wish them designated, but for numbers generally, and for any magnitudes, about which we mean to reason. The letters of the alphabet may be thus employed. They may, consequently, be considered as representative of quantity in general, and may be operated on in the way of addition, subtraction, and comparison, precisely as the arithmetical digits themselves. The letter a, for instance, may denote any number, whether *whole*, *fractional*, or *mixed*, and any magnitude or quantity that can be measured, as a line, a weight, the altitude of a hill, or the breadth of a river. So may b, and all the rest of the alphabetical characters; which, consequently, may be used as the representatives of quantity in general, or in the abstract, that is, without being restricted to any particular degree or species of quantity. As the representatives of quantity, then, they may be subjected to every operation of which quantity itself is susceptible.

We are now in possession of a system of characters, or conventional symbols, namely the *letters* of the alphabet, and the signs already explained, which, by greatly abridging common language, will be found to aid us materially in reasoning on quantity of any kind; for it not only denotes quantities themselves, namely, by means of the letters a, b, c, d, &c. x, but also specifies the operations which are made on them, namely, by means of the signs $+$ *plus*, $-$ *minus*, $=$ *equal to*, $\times$ *multiplied into or by*, $\div$ *divided by*, and $:$, *in the ratio of*, or *in proportion to*. This, then, is the foundation, and these are the elements of the science, which, from its generality, or the extent of its application, has been ennobled by the title UNIVERSAL ARITHMETIC, or, as it is commonly called, ALGEBRA. Some examples of notation and numeration, by means of these alphabetical characters and signs, will at once shew the comprehensiveness of the science, and point out certain principles which must influence its practical rules.

In the language of algebra, as we have seen, the letters a, b, &c. may represent any numbers whatever. It is proposed to add them together. This may be done by means of the sign $+$ placed between them. Accordingly, the expression $a + b$ signifies the sum of the quantities so denoted, or the amount of them taken together. Moreover, $a + a$ is obviously the same as $2a$, for it is a added to itself; $b + b = 2b$, for the same reason; and, universally, $a + a + a$, &c. repeated to any number of times, say to a number denoted by m or x, is the same as $m a$ or $x a$, or, transposing the places of these letters, which does not alter their value, the same as $a m$ or $a x$; and, in like manner, $b + b + b$, &c. to the number of times denoted by n or y, is the same as $n b$, $y b$, $b n$, or $b y$. We can therefore represent quantities as multiplied together, without using the sign $\times$, and it is frequently found convenient to do so. All that is necessary for the purpose is the placing of the symbols denoting the quantities close together, so as to form, as it were, a word or syllable. Thus, then, $a b$ signifies, not the addition of a and b, but their *product*, the multiplication of one by the other, that is, that one of them is to be taken as often as is denoted by the other; and thus any magnitudes considered as multiplied together may be expressed, as $a, b, c, d, \ldots x$.

On the other hand, the difference between two quantities denoted by a and b, the former being the larger, can be represented by means of the sign $-$, meaning *made less by*; thus, $a - b$ is the difference between a and b, and $a - 2b$ is the difference between a and $2b$, that is, b taken twice. And all cases of division, which has been shewn to be a continuous subtraction, can be represented by means of the sign $\div$, or by placing the quantity to be divided, or the dividend, above a line, and the quantity that is to divide it, or the divisor, below the line, as $\frac{a}{b}$, $\frac{a + b - c}{d + e - f}$.

Now, addition and subtraction being opposite to each other, and all quantities being considered as having the mark of one or other before them, there is a corresponding opposition between their affections as so expressed, although the quantities themselves may be equal in respect of magnitude. The quantity having, or being supposed to have the mark of addition before it, is called a *positive* quantity; and that which has the mark of subtraction before it, is called a *negative* quantity. But though thus opposite, and thus denominated, they are equally real, and, as already mentioned, may be equal in magnitude; in which case they would, considered as representing sums of money, mechanical powers, or any other objects of the same kind, destroy each others effect. Thus, a man may be indebted to his creditors to the amount denoted by a, and have money due to him to the same amount. In estimating his real condition, we must consider these equal sums as opposite to each other, or that one of them as it were neutralizes the other. In the same manner, forces drawing a body in a certain direction may be conceived as counterbalanced by equal forces in the contrary direction; and in this case the former, represented as *affirmative*, or marked $+$, would be stated as equal to the latter, represented as *negative*, or marked $-$. But it is quite obvious, that the forces, however expressed by us, are real in both. In other words, a *decrement* may be equal to an *increment*, though it have a contrary effect. Hence, a negative quantity may be said to be less than nothing, because opposite to a positive, and therefore, when joined to it, diminishes it; but it is nevertheless as real as the positive, and, considered in relation to some other quantity, might itself also be represented and reasoned on as positive. In so far as magnitude alone is concerned, therefore, $+ a$ and $- a$ are equal; and in reasoning on their proportion to each other, we confine ourselves entirely to their magnitude, and do not take any of their qualities into account.

13. A quantity is called *compound*, which consists of several quantities connected together by the signs $+$ and $-$, as $a + b - c + d - e$; and no difference is made on the value of it by altering the order of the letters, $b - c + a - e + d$, $b + a + d - c - e$, or any other arrangement having precisely the same value, as might be easily demonstrated by substituting numbers for the letters, and operating on them as expressed by the signs. But it is usual to place the letters in their regular alphabetical order, and it is also usual to make an affirmative quantity take precedence, in which case the sign $+$ is not expressed, but understood, as it always is when the negative sign is not given. A quantity is called *simple* or *monomial*, which consists of only one term or part. Quantities are said to have as many *terms* as there are parts in them, joined by the signs $+$ and $-$; $a + b$, or $a - b$, consists of two terms, and is called a *binomial*; $a + b + c$, or $a + b - c$, is a *trinomial*; and quantities of more terms are called in general *polynomial*.

14. Any number prefixed to a letter is called a *numeral co-efficient*, and denotes how often the quantity represented by any two letters is to be taken. Thus $4a$ signifies that the quantity a is to be taken four times; $5b$, that b is to be taken five times, and so on. When no number is prefixed, unit or 1 is understood to be the co-efficient. Thus c is c taken once, or is the same as $1c$.

Number.

15. Quantities are said to be *like*, or *similar*, which are represented by the same letters; and *unlike*, which are represented by different letters. Thus 4 a and 5 a are like; 4 a and 5 b, unlike.

16. In a quantity consisting of the product arising from the continual multiplication of two or more quantities, the whole product or quantity is called a *factum*, the several multipliers are *factors*, and in relation to each other are called *fellow-factors*, and sometimes *co-efficients*. Thus, omitting the sign of multiplication, as already mentioned, $a\,b\,c\,d$, or the whole product, consisting of the continual multiplication of the four letters, are the *factors*, and the four letters themselves taken separately, as a, b, c, d, or in pairs $a\,b$, $c\,d$, or one separately and the rest together, as a, $b\,c\,d$, are *fellow-factors*.

17. The character called a *vinculum*, which is a straight line drawn over two or more quantities, as $\overline{a+b+c}$, is used to denote that all the quantities under it are to be considered as forming one quantity, and so to be treated in any operation that may be expressed. It is frequently used in cases of multiplication. Thus, $a\times\overline{a+b}$ signifies that a is to be multiplied into the whole numbers denoted by $a+b$; whereas $a\times a+b$, without the vinculum, signifies that a is to be multiplied by a, and b to be added to the product. Quantities under the vinculum are read by pronouncing the word *both* or *all* in relation to them; the former in the case of two quantities, the latter in the case of three or more.

Any sign prefixed to a fractional quantity, is considered as belonging to both numerator and denominator, or to the whole quantity. Thus $\frac{a+b}{c}+\frac{d+e}{f}$ signifies that the whole fraction $\frac{a+b}{c}$ is to be added to the whole fraction $\frac{d+e}{f}$; and $\frac{a+b}{6}+\frac{a-b}{5}$ that the whole of $\genfrac{}{}{0pt}{}{\overline{a+b}}{6}$ is to be multiplied into the whole of $\frac{a-b}{5}$. We read fractions of this kind as if they were under a vinculum. For example, the first of these, $a+b$ *both* by c, *plus* $d+e$ *both* by f.

18. The signs $>$ and $<$ placed between quantities, are frequently used to signify that the quantity which is placed on the open side of the two lines, is greater than the quantity which is placed at the point or closed side of the two lines. Thus $a > b$ signifies that a is greater than b, or, which is the same thing, that b is less than a. But the expression gives no information as to the amount of the excess of one above the other.

We are now prepared to understand the rationale of the following rules, used in the practice of Common Arithmetic.

Common Arithmetic.

COMMON ARITHMETIC.

Addition.—Place the numbers which are to be added together in such a manner that those of one denomination or degree be in the same vertical line, namely, units under units, tens under tens, hundreds under hundreds, and so forth, and draw a line under the whole; reckon up the numbers, or ascertain the amount of the first column on the right hand, and if the sum be under ten mark it immediately below the column; but if it be ten, or if it exceed ten, in any degree whatever, mark down the number of its units as above, and suppose *one* for every *ten* it contains to be added to or to form a part of the second column, to which you next proceed, and on which, as on every other column, you are to operate in the same way, till you have gone over all the columns, the full amount of the last of which is to be marked down in its own order. The sum of all the numbers is expressed by the series of figures so obtained.

$$\text{Example:}\quad \begin{array}{r} 5\,3\,8\,6 \\ 3\,5\,1\,7 \\ 8\,9\,4\,1 \\ 6\,1\,8 \\ 5\,4 \\ 9 \\ \hline 1\,8\,5\,2\,5 \\ \hline \end{array}$$

These are arranged as directed, units under units, tens under tens, &c. Here the numbers in the column of units, that is, the first column on the right, are, commencing at the bottom, 9, 4, 8, 1, 7, 6, which, being taken together, make in all *thirty-five*, that is, *three tens* and *five units*. We, therefore, put down 5 under the column, and suppose 3 to be added, or as it is usually expressed, we *carry* it to the next column, which contains 5, 1, 4, 1, 8. These, together with the 3 *carried*, make *twenty-two*. Accordingly, we put down 2 under the second column, and carry 2 to the third column, where we find 6, 9, 5, 3, which, with 2, make *twenty-five*. Marking down 5, therefore, under the third column, we carry 2 to the fourth, consisting of 8, 3, 5, making with it *eighteen*, which we put down in full.

The reason for carrying tens from one degree to another must be easily discovered from what was formerly mentioned on the subject of notation and numeration; but that it may be quite obvious to the uninitiated reader, if there be such who thinks proper to study this essay, another example will be given, in which it will appear, that if the sums of each column be given separately, we must afterwards add them together in order to obtain the full amount. Let the numbers be 658241, 425306, 136032, 372180, 863915, which arranged as directed will stand as follows, a word being placed over each column to denote its degree, and a doted line being put between them for sake of greater distinctness.

		Hun.of thousands.	Tens of thousands.	Thousands.	Hundreds.	Tens.	Units.			
		6	5	8	2	4	1			
		4	2	5	3	0	6			
		1	3	6	0	3	2			
		3	7	2	1	8	0			
		8	6	3	9	1	5			
The sum of the column of units is						1	4	that is . . .	14	Units.
The sum of the column of tens is					1	6		. . . .	160	Tens.
The sum of the column of hundreds is				1	5			. . . .	1500	Hundreds.
The sum of the column of thousands is			2	4				. . . .	24000	Thousands.
The sum of the column of tens of thousands is		2	3					. . . .	230000	Tens of thousands
The sum of the col. of hundreds of thousands is	2	2						. . . . . .	2200000	Hun.of thousands
Which together make . . .	2	4	5	5	6	7	4		2455674	

Compare this with the process specified in the rule as applied to the same numbers, and the difference in brevity will be made apparent.

6 5 8 2 4 1
4 2 5 3 0 6
1 3 6 0 3 2
3 7 2 1 8 0
8 6 3 9 1 5

2 4 5 5 6 7 4 The sum as before.

Readiness and correctness in performing addition are of immense value in the business of life. They are to be acquired chiefly by practice. But some suggestions may be given, with a view to the attainment of expertness in it. Thus, after a person is able readily to add any two figures together, he will find it easy to add one figure to any sum, by recollecting certain obvious correspondences which necessarily arise from the principle of the denary notation. For example, *seven* and *eight* make FIFTEEN; *seventeen*, which is ten more than *seven*, make ten more, if added to the same number, *eight*, that is to say, *twenty*-FIVE; *twenty-seven* and *eight* make *thirty*-FIVE, and so forth, FIVE always occupying the place of units. In like manner, *eight* and *nine* make SEVEN*teen*, and SEVEN occupies the place of units, in the sum arising from the addition of *nine* and *eight*, however coupled with the multiples of *ten*. Again, two or more figures occurring in the same column may be considered as forming one, and thus be at once added to any sum. This is particularly easy where the two figures amount to *ten*, as, 9 and 1, 8 and 2, 7 and 3, 6 and 4, 5 and 5; or 2, 3, and 5; and 3, 1, and 6, &c. Sometimes the recurrence of the same number in a column admits of the process of multiplication, to be afterwards more explained; but which, as already mentioned, is merely a continuous addition. Not unfrequently, it is convenient to begin at the top of a column, rather than at the bottom; and occasionally to conceive the *carried* number combined with the second or third digit in a column, so as to make up *ten*, or any other easily combined number. Some persons have so little confidence in their power to recollect numbers that they find it necessary, and there are occasions on which, for the sake of shewing or proving the correctness of an addition, it is found convenient, in place of keeping in the mind the tens which are to be carried to the higher columns, to set down little marks for them at all the positions in which they occur, to be afterwards taken together, and so added to the higher denomination. Others, again, find it perfectly practicable to add up two columns at once, or almost simultaneously; and where the number of rows is not great, even three or more columns may be added together, by nearly a single glance of the eye. This will be readily admitted, when it is recollected, that the numbers may be so low in the columns, as not at all, or rarely, or only to a small degree, to exceed ten. Thus, in the following examples, we may see immediately, that the process of addition is either not at all, or not much, burdened with numbers to be carried, and that the sums of the respective columns can be obtained, as it were, by one operation.

320	532	3406	6325
453	765	4382	3562
773	1297	2101	3103
		9889	12990

The sum of every two numbers, from 1 to 9, will be found in the following table, which ought to be committed to memory. Its construction is quite simple. One of the numbers required to be added will be found contained in the horizontal line of numbers at the top, and the other in the vertical line at the side, and the sum of the two stands at the place of their junction.

TABLE OF ADDITION.

1	2	3	4	5	6	7	8	9	
2	3	4	5	6	7	8	9	10	1
	4	5	6	7	8	9	10	11	2
		6	7	8	9	10	11	12	3
			8	9	10	11	12	13	4
				10	11	12	13	14	5
					12	13	14	15	6
						14	15	16	7
							16	17	8
								18	9

In order to verify or prove the accuracy of addition, we may have recourse to one of the following methods, the explanation of which may be inferred from what has been already said.

1. If the addition has been commenced from the bottom of each column, perform it again in the reverse order, that is, by commencing at the top, and see if the results agree.

2. The numbers to be added may be divided into parcels, each of which may be reckoned up separately, and then the sums of the *respective* parcels may be brought together.

3. Every particular series of the numbers may be consecutively taken from the alleged sum of the whole, till, if the addition be correct, there be no remainder.

When addition is applied to the repetition of any number so many times, or, in other words, when any figure, or series of figures, has to be added to itself a certain number of times, the operation, as already mentioned, takes the name of multiplication; and in this case we call the sum the *product*, one of the numbers, namely that which is to be repeated, the *multiplicand*, the other, namely that which denotes how often it is to be repeated, the *multiplier*, and the two together the *factors*. Suppose, for instance, it were required to take 5 six times, or 6 five times, that is to multiply these together, we might set the numbers down, and add them thus;— namely, 5 six times, or 6 five times, and collect their sum, which is 30. From this example, and an infinitude of other examples might be adduced, it is evident that multiplication is merely a concise method of adding any given number to itself as often as may be proposed.

1	5		1	6
2	5		2	6
3	5		3	6
4	5	or	4	6
5	5		5	6
6	5			30
	30			

When neither the multiplicand nor the multiplier exceeds 9, the product is to be found in the following table.

MULTIPLICATION TABLE.

1	2	3	4	5	6	7	8	9
2	4	6	8	10	12	14	16	18
3	6	9	12	15	18	21	24	27
4	8	12	16	20	24	28	32	36
5	10	15	20	25	30	35	40	45
6	12	18	24	30	36	42	48	54
7	14	21	28	35	42	49	56	63
8	16	24	32	40	48	56	64	72
9	18	27	36	45	54	63	72	81

The first horizontal line at top consists of numbers from 1 to 9 inclusive, in their natural order of increase by units. In order to obtain the product of any one of them by 2, we add it to itself once; and this process being performed throughout, gives us the second line, in which, it may be observed, every number is the double of that which stands above it. To have the product of the numbers by 3, we have only to add them once to their product by 2, that is, to add the first and second lines together, which gives us the third line. To obtain the fourth, which exhibits the product of the numbers by 4, we have either to add the third line and the first together, or to take the double of the numbers in the second line. The fifth, which gives the product by 5, may be had by adding either the first and the fourth, or the second and the third, together. The sixth, by *doubling* the *third*, *trebling* the second, adding together the second and fourth, or the first and the fifth; and so on, till we come to the ninth, which gives the product by 9, and which may be had variously, as by adding together the first and the eighth, the second and the seventh, the third and the sixth, and the fourth and the fifth, or by taking the numbers in the third three times, or those in the second four times, and adding the first. It is obvious on inspection, and it follows from the construction of the table, that the first vertical line on the left is the same as the first horizontal one at the top; that the second vertical is the same as the second horizontal, the third as the third, and so throughout; and accordingly, as before shewn, the product of any two numbers is just the same whichever we make the multiplicand and whichever the multiplier, 5 times 6 being equal to 6 times 5, and 7 × 9 = 9 × 7. The product of any two numbers given in the table is to be found in that compartment of it where the horizontal and the vertical lines or columns in which they are placed meet; and from what has now been said, it seems indifferent whether the multiplicand be sought for in the first vertical, and the multiplier in the first horizontal line, or *vice versa*.

The principle of this table may be extended to any amount beyond the nine digits. Thus the first and the ninth horizontal lines being added together, or the fifth taken twice, would give the products of the numbers by 10, in all of which, as is well known, the character occupying the place of units will be a cypher, and that which occupies the place of tens will be the very number that is to be multiplied. Hence, universally, in multiplying any number by 10, we need only add a cypher to the right hand of it, thus, 2 × 10 = 20, 6 × 10 = 60. Again, to multiply any number by 11, it is very clear that we have merely to substitute the number for the cypher, that is, to put it in the unit's place, in addition to that of the place of tens, or, in other words, to write down the number in both. Thus 5 × 11 = 55, 8 × 11 = 88. In multiplying by 12, the number which occupies the place of units must be doubled, and, if it be more than 4, one must be carried to the place of tens. Thus 7 × 12 = 84. In multiplying by 13, the number occupying the place of units must be tripled, and if it exceed three, one or more must be carried to the place of tens. Thus 9 × 13 = 117. We obtain the same results by adding together the products of the numbers corresponding with or which together make one of them, as given under the other in the table. For example, to multiply any number by 13, suppose 9, as above, we look under 9 for the products of any two numbers which together make up 13, namely, 6 and 7, that is 54 + 63 = 117, or 5 and 8, that is 45 + 72 = 117, or 4 and 9, that is 36 + 81 = 117. Again, to multiply suppose 6 by 17, we look under 6 for the products of two numbers which together make 17, namely, 8 and 9, that is 48 + 54 = 102. Various other properties and uses of this table might be enumerated; but these may suffice to show its value, and to prove the propriety of the recommendation to have it thoroughly impressed on the memory. On inspecting the table, it will be observed, that several products are repeated, or, in other words, that the multiplication is performed twice, in consequence of considering and operating on the same numbers both as multiplicands and multipliers. It may be proper, then, to give the table in a simpler form. Thus:

1 . . .	2	3	4	5	6	7	8	9
2 . . .	4	6	8	10	12	14	16	18
3		9	12	15	18	21	24	27
4			16	20	24	28	32	36
5				25	30	35	40	45
6					36	42	48	54
7						49	56	63
8							64	72
9								81

Prosecuting the principles already explained, and in order to facilitate the practice of multiplication, a table, containing the mutual products of all the numbers from 11 to 99, has been given by Mr Leslie, in his erudite work on arithmetic, to which we must refer the studious reader.

We are now in a condition to multiply any two series of numbers together. The operation will be facilitated, or at least rendered more clear, by the adoption of a regular method of procedure. There are several cases, each of which may require a particular treatment; but the fundamental principle is the same in all, and may be shortly expressed. Multiplication requires that the multiplicand be added to itself as many times as there are units in the multiplier; so that it follows, all the figures of the multiplicand must be multiplied by all the figures of the multiplier; consequently there must be as many particular *products* as there are figures in the multiplier, and their particular products must all be gathered into one sum. It is obvious, then, that the first object must be to obtain the particular products, and the next so to arrange them in their proper places, namely, units under units, tens under tens, &c. that the last step, or the collecting together of the particular products, be according to the rule of addition. For these purposes, generally, having placed the multiplier immediately below the multiplicand, care being taken to preserve the arrangement now mentioned, and a line being drawn below both, we commence the operation with that figure of the multiplier which has the unit's place, and with it multiply the figure in the unit's place of the multiplicand. Should their product be less than ten, put it down in its proper place, that of units, and proceed to the next figure of the multiplicand; but should the product equal or exceed ten, put down the excess, as in addition, and carry one for every ten to be added to the next product, with which proceed in the same way, and so on throughout the whole of the multiplicand. The next figure of the multiplier is then to be operated with on the multiplicand, and their particular product obtained, which is to be placed so that its first figure on the right hand shall occupy the place of tens, or be put down directly underneath, that is, in the vertical line of the multiplying figure. Use the third and every other figure of the multiplier in like manner, till the whole be exhausted; after which the process of addition is to be had recourse to, in order to collect the particular products thus arranged into one sum. A single example, properly explained, will elucidate the rule beyond the possibility of mistake. Let the numbers to be multiplied be 58436 for a multiplicand, and 458 for a multiplier.

$$\left.\begin{array}{r}58436\\458\end{array}\right\}\text{ The factors.}$$

467488	The first particular product with	8
292180	The second particular product with	50
233744	The third particular product with	400
26763688	The general product with	458

If we find a cypher or cyphers at the right hand of either of the factors, we may neglect them till the particular products are obtained, when we annex to their sum as many cyphers as are in either or both. Thus:

$$\begin{array}{r}
4670\\
830\\
\hline
1401\\
4536\\
\hline
4676100\\
\hline\hline
\end{array}$$

In order to multiply by 10, 100, 1000, &c. we have merely to annex the cyphers of the multiplier to the figures of the multiplicand. Thus

$$69 \times 10 = 690$$
$$457 \times 100 = 45700$$

In multiplying by large numbers, that is, numbers consisting of many digits, we may divide, or suppose divided, both multiplicand and multiplier into parts, and having got their products in the great multiplication table, set them down in their proper order, and then perform addition as before. For example, multiply 83625914 by 538692.

$$\begin{array}{rl}
83\ 62\ 59\ 14 & \\
53\ 86\ 92 & \\
\hline
1288 & \\
542800 & \\
57040000 & \\
7636000000 & \left.\vphantom{\begin{array}{c}1\\1\\1\\1\end{array}}\right\} \text{Product by 92.}\\
120400 & \\
50740000 & \\
5332000000 & \\
713800000000 & \left.\vphantom{\begin{array}{c}1\\1\\1\\1\end{array}}\right\} \text{Product by 8600.}\\
7420000 & \\
3127000000 & \\
328600000000 & \\
43990000000000 & \left.\vphantom{\begin{array}{c}1\\1\\1\\1\end{array}}\right\} \text{Product by 530000.}\\
\hline
45048610864488 & \text{Product by 538692.}\\
\hline\hline
\end{array}$$

The same example in the common mode:

$$\begin{array}{r}
83625914\\
538692\\
\hline
167251828\\
752633226\\
501755484\\
669007312\\
250877742\\
418129570\\
\hline
45048610864488\\
\hline\hline
\end{array}$$

There is a mode of performing multiplication, chiefly, if not entirely by addition, which, from its correctness and ease, will be found of great utility in large numbers, and therefore deserves attention. The principle on which it proceeds must be quite apparent to those who have carefully studied the preceding remarks. In a vertical column, and beginning at the top, place the nine digits and 10 in their natural order: set the multiplicand immediately over against 1; the double of it over against 2; its treble, or the sum arising from the numbers in the two lines above, over against 3; its quadruple, or the sum of the third and the first line, or the double of the second line of numbers, over against 4; the sum of the first and the fourth, or the second and third, over against 5; that of the first and fifth, or second and fourth, or the treble of the second, or double of the third, over against 6, &c. &c., as far as to the 10th line; which, if the operation be rightly done, will contain the multiplicand ten times, or be the same as the multiplicand with a cypher at the right hand. It being evident that the products of the multiplicand, with every number of the multiplier, are thus given opposite to their corresponding indices, all that is now necessary is to collect, by addition, the whole products into one sum, paying due regard to their respective values.

Thus, to take the same example as the last, namely, 83625914 × 538692; that is,

$$83625914 \times \left\{\begin{array}{r}500000\\30000\\8000\\600\\90\\2\\\hline 538692\end{array}\right.$$

Index.	Multiples.		Products.			
1	83625914					
*2	167251828	=	multipd.	× 2	=	167251828
*3	250877742	=	do.	× 30000	=	2508777420000
4	334503656					
*5	418129570	=	do.	× 50000	=	41812957000000
*6	501755484	=	do.	× 600	=	50175548400
7	585381398					
*8	669007312	=	do.	× 8000	=	669007312000
*9	752633226	=	do.	× 90	=	7526332260
10	836259140 Proof.					

or to take these sums in their proper order, according to the multiplier,

$$\begin{array}{rl}
167251828 & \\
752633226 & \\
501755484 & \\
669007312 & \\
250877742 & \\
418129570 & \\
\hline
45048610864488 & \text{Product}\\
\hline\hline
 & \text{as before.}
\end{array}$$

Here we have placed a cross at every figure of the index that is contained in the multiplier; and it is clear that the line opposite to each contains the product of the multiplicand with the corresponding figure; so that we have the general product in the addition of the whole, as is shown by the opposite summation. In working this example, we have, for explanation's sake, taken all the multiples of the multiplicand; but, in practice, it is enough to take those only which are required by the multiplier. Sundry other abridgments of the process which might be mentioned, are left for the exercise of the reader's own ingenuity and discernment.

In order to prove a multiplication effected by one mode, we may perform it in another. The common method, by casting out the *nines* as it is called, is not necessarily correct, and can only afford a strong presumption of accuracy, but is very useful. It depends on the principle, that as every large number must always consist of repeated *nines* with some remainder, every multiplicand and multiplier must contain certain multiples of nine with corresponding excesses; and that their product must also contain multiples of nine with the product of these excesses. A better correction is afforded by the operation of which we have next to treat, namely,

Division,--That process or rule by which one number may be speedily subtracted from another, as often as it is contained in it, and the nature of which is such that the product of the number called the divisor, which divides, or, in other words, measures another, and the number which is produced by the division, or the *quotient*, shall, with the addition of any remainder, be equal to the number that is divided, or the dividend. Division, or continued subtraction, and multiplication, or continued addition, therefore, are converse operations, and may consequently be employed to prove each other. It may be presumed that the rationale of the operation will now be readily understood; and accordingly, after announcing the general rule, we shall proceed to lay down some special directions for the practice of it.

General rule.—Discover how many times the divisor is contained in or measures either the whole or the highest numbers of the dividend, which is to be done by finding the greatest product of the divisor multiplied by a single figure that can be contained therein, and mark down that figure in the quotient. Subtract the product from the whole dividend, or these highest numbers of it; and, in this latter case, bring down to any remainder, one or more, as may be required, of the other figures of the dividend, on which operate as before; and proceed in the same manner, till the whole dividend be gone through. The figures in the quotient indicate how often the divisor is contained in the dividend.

Particular directions.—Place the divisor on the right hand of the dividend, a line of separation being drawn between them, and draw another line under it, so as to separate it from the sought-for quotient.

The chief difficulty of the operation consists in the discovery of such quotient figures as are neither too large nor too small; and, in order to this, observe, 1. That as often as the first figure of the divisor is taken from that of the dividend, so often must the second of the former be taken from the second of the latter, (with the remainder joined); and as often must the third be taken from the third, &c. whatever be the number: But, if the first figure of the divisor cannot be taken from that of the dividend, then, 2dly, as often as the first figure of the divisor is taken from the first and the second of the dividend, so often must the second of the divisor be taken from the third of the dividend, joined with the remainder of the second; and so often must the third of the divisors be taken from the fourth of the dividend, &c. In short, the principle of division applicable to the whole is equally applicable to every part of the operation; and so the quotient of any portion must be such a number as, multiplied into a partial or the entire divisor, will, with any remainder that may exist, yield a product equal to such a portion of the dividend as is operated on. An example or two will elucidate the process. Divide 2649 by 3:

```
2649  | 3  divisor.
24:    883 quotient.
 ___
 24
 24
 ___
  9
  9
 ___
  0
```

Here we compare the divisor, 3, with the first and second figures of the dividend, for it is not contained in the first alone, and we find that it may be taken from them 8 times, 2 being left over; we therefore place 8 for the first figure of the quotient, and with it we multiply the divisor, for the purpose of having the product subtracted from the dividend; to the remainder, namely 2, we bring down the next figure of the dividend, namely 4, making 24, in which 3, the divisor, is contained exactly 8 times; so that we have 8 again for the quotient: there now remains only one figure of the dividend, namely 9, in which 3 is contained exactly 3 times. The whole quotient, therefore, is 883, which, multiplied by 3, will accordingly reproduce the dividend. Again, to take an example in which the divisor consists of several figures, divide 479551381 by 6452:

```
 Dividend
479551381  | 6452  divisor.
45164        74326 quotient.
_____
 27911
 25808
 _____
  21033
  19356
  _____
   16778
   12904
   _____
    38741
    38712
    _____
       29 Remainder.
```

The nature of the operation will be completely understood, on going over it in detail, thus. It is evident that the divisor, 6452, consisting of *four* digits, cannot be taken from the first four digits of the dividend. Therefore we comprehend another figure in that portion which we have first to divide, and in which we find the divisor is contained seven times with a remainder. For 6452 × 7 = 45164 = 47955 — 2791 : or,

$$\begin{array}{r} 47955 \\ 6452 \times 7 = 45164 \\ \hline 2791 \end{array}$$

to which remainder bring down the next figure of the dividend, viz. 1., and thus the second portion to be divided will be 27911, with which proceed as before:

$$\begin{array}{r} 27911 \\ 6452 \times 4 = 25808 \\ \hline 2103 \end{array}$$

to which remainder bring down the next figure of the dividend, viz. 3, which gives us 21033 for our third operation:

$$\begin{array}{r} 21033 \\ 6452 \times 3 = 19356 \\ \hline 1677 \end{array}$$

to which bring down the next figure, namely 8, and then we have 16778 to divide,

$$\begin{array}{r} 16778 \\ 6452 \times 2 = 12904 \\ \hline 3874 \end{array}$$

to which remainder bring down the next figure of the dividend, namely 1, which gives 38741 to be divided in the last place:

$$\begin{array}{r} 38741 \\ 6452 \times 6 = 38712 \\ \hline 29 \end{array}$$

Now, collecting the particular quotients from these particular steps we have 74326, as before, and 29 of a remainder; and we verify the operation by shewing that 74326 × 6452 = 479551381 — 29; or that 6452 × 74326 + 29 = 479551381.

There is a mode of effecting division similar to that given for facilitating multiplication, and it consists in tabulating the divisor, as was done in the other case with the multiplicand, the object being to discover what figure is to be placed in the quotient. The progress will be seen in the same example: 479551381 ÷ 6452.

1	6452)	479551381	74326 quot.
2	12904	45164	opposite to 7 as the index.
3	19356	———	
4	25808	27911	
5	32260	25808	opposite to 4.
6	38712	———	
7	45164	21033	
8	51616	19356	opposite to 3.
9	58068	———	
——	———	16778	
10	64520	12904	opposite to 2.
		———	
		38741	
		38712	opposite to 6.
		———	
		29	

Here we find the figures of the quotient at once and without trial, for they are the *indices* of those numbers which come nearest to the successive portions of the dividend, as will be evident on inspection.

The remainders are generally placed over the divisors, after the quotients; thus, in this example, 74326 $\frac{29}{6452}$, and are obviously *vulgar fractions*; which brings us to notice the application of the rules now delivered to

FRACTIONAL ARITHMETIC.

The first thing to be remarked respecting fractions is, that they may be *proper* or *simple*, that is, less than a unit; as $\frac{1}{2}$, $\frac{1}{3}$, $\frac{4}{7}$; *improper*, that is, more than a unit, as when the numerator is greater than the denominator, for example $\frac{3}{2}$ or $\frac{9}{7}$; or *compound*, that is, a part of a part, the fraction of a fraction, as when two or more numerators and denominators are connected together by the word of, thus $\frac{1}{2}$ of $\frac{4}{5}$, or $\frac{2}{3}$ of $\frac{1}{4}$: and the chief fundamental principles on which the rules concerning fractions depend, are as follows:

It has been shewn that, in some cases of division, the dividend does not contain the divisor a certain number of times exactly, but that there remains a portion over and above the multiples of the divisor; and that this must in some way or other be expressed as related to the quotient. For example, let 17 be divided by 4. Here, it is evident, the quotient is more than 4, for 4 × 4 = 16; and it is less than 5, for 4 × 5 = 20. It must lie between these two numbers, being more than the one, and less than the other. Now 17 = 16 + 1. To divide it, therefore, into four equal parts, we must not only divide 16 into 4 parts, but also 1 into 4 parts, and express both in the quotient, which, accordingly, is $4\frac{1}{4}$. In short, whenever the dividend does not contain the divisor exactly, the operation discloses a remainder, or a certain excess of the dividend over the product of the divisor and the units of the quotient; and in order to complete the quotient, we must conceive a unit of the dividend to be broken into as many equal parts as there are units in the divisor, and take as many of these as there are units in the remainder. Obviously, these subdivisions of units are less than units; and in the valuation of such portions, or *fractions*, two things are to be considered, the number of the parts into which the unit is divided, or the *denominator*, and the number of the parts which are to be taken, or which constitute the *numerator*. Attending to the first of these, we speak of the halves, the thirds, the fourth, fifths, &c. of any unit; and by means of the second, or the amount of the numerator, we specify what number of these parts is to be reckoned. It follows from this account of fractions, that we augment their value by increasing the numerators, the denominators remaining the same; that we diminish their value by lessening the numerators, the denominators remaining the same; that, on the contrary, if the numerators remain the same, we decrease their value by augmenting, and increase it by diminishing the denominators, so that the multiplications and divisions of the denominator produce inverse effects on the fractions themselves. These particulars may be thus represented, for the sake of the memory:

$$\left.\begin{array}{l}\text{To multiply}\\\text{To divide}\end{array}\right\}\text{the numerator is}\left\{\begin{array}{l}\text{To multiply}\\\text{To divide}\end{array}\right\}\begin{array}{l}\text{a frac-}\\\text{tion.}\end{array}$$

$$\left.\begin{array}{l}\text{To multiply}\\\text{To divide}\end{array}\right\}\text{the denominator is}\left\{\begin{array}{l}\text{To divide}\\\text{To multiply}\end{array}\right\}\begin{array}{l}\text{a frac-}\\\text{tion.}\end{array}$$

It is a necessary consequence of these principles, that if the numerator and denominator of a fraction be either both multiplied or divided by the same number, the value remains unchanged; and hence, which is often very convenient in practice, we can easily reduce any whole number to the form of a fraction having any denominator whatever: and we can as easily express any fraction in a variety of ways without changing the value of it; for there are innumerable numbers by which both numerator and denominator can be multiplied, so as to alter its form or expression, without having any other effect on its character. Now, as a fraction may thus be expressed variously, it is often of consequence to ascertain its lowest terms, or to reduce it, in point of expression, to its smallest numbers. The mode by which this is to be accomplished is the discovery of any number which will exactly divide both numerator and denominator; for if their division be thereby effected to the fullest extent possible, the two quotients will present the numerator and denominator of another fraction of precisely the same value, but expressed in the lowest terms. The number which accomplishes this, without leaving any remainder, is called a *common divisor*; and it sometimes happens that there is a difficulty, at other times an impossibility, to discover such. A few remarks will aid in the enquiry, and, therefore, prove useful in practice. The number 2 will divide all even numbers, and, therefore, invariably answer as a common divisor, where the terminating figure of both numerator and denominator is 2; all numbers ending with a cypher are divisible by 10; and all numbers ending with 5, or with a cypher, are divisible by 5. If neither 2, 5, nor 10 divide both numerator and denominator, make trial of 3, 7, 11, 13, 17, 19, successively, dividing numerator and denominator by each as often as possible. Or, divide the denominator by the remainder, if any, that remainder by the next remainder, if any, and so on till nothing or units remain; the last divisor will be the number sought for; but if units remain, the fraction is already in the lowest terms.

Fractions of different denominations may be changed into fractions of one denomination, still retaining their value, by multiplying each numerator by all the denominators, except its own, for the new numerators, and multiplying all the denominators together for a common denominator. We bring a whole number into the state of an improper fraction by making 1 the denominator, if no denominator be given; by multiplying it by the denominator if there is one: and mixed numbers, by multiplying the integers or whole numbers with the denominator of the given fraction, and adding the numerator to the product, which gives us the numerator of the fraction required. On the other hand, we reduce an improper fraction to a whole or a mixed number by dividing the numerator by the denominator for the whole number, and annexing the remainder, if there be any, with the denominator placed under it; and a compound fraction is reduced to an equivalent simple fraction by multiplying all the numerators together for the numerator of the simple fraction, and all the denominators for the denominator, and then abridging the fraction so produced, if practicable, or carrying it into its lowest terms.

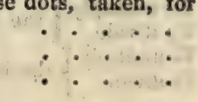
Fractions of different numerators and denominators cannot be compared together so as to have their relative value ascertained; and hence the necessity for some of the preceding operations, in order to effect their addition and subtraction. Thus, for addition, having previously reduced any number of fractions into others having the same denomination, we find the sums of all by adding their several numerators together, and subscribing the common denominator; and for subtraction, having taken the same preliminary step, we subtract the less numerator from the greater, and subscribe the common denominator. Whole and mixed numbers, to be compared with fractions, must be treated in like manner. As to the multiplication and division of fractions, it is proper to observe, in order to obviate misapprehension arising from the use of the word multiplication, that whereas the value of whole numbers is increased by their being multiplied together, or that the product is greater than either of the factors, the case must necessarily be the reverse in the multiplication of proper fractions, and the product be less than either of the factors. In other words, whenever the multiplier is less than one, that is, a fractional part of one, the product will be less than the multiplicand. For a similar reason, though in division of whole numbers the quotient is always less than the dividend, in that of fractions it is not always so; for as, in division, we ascertain how often the divisor is contained in the dividend, if the divisor be *one*, it will be found as often as there are units in the dividend, in which case the dividend and the quotient will be equal, so, if the divisor be less than unit, it must be found oftener than there are units in the dividend. This being understood, the rules for multiplication and division of fractions, will be quite intelligible. When the multiplier is a whole number, we multiply, as is always practicable, the numerator of the fraction by the multiplier for a new numerator, and retain the denominator; or, if it can be done, retaining the original numerator, we divide the denominator by the multiplier, the quotient giving us the new denominator; and where both multiplier and multiplicand are fractions, after reducing and abbreviating, multiply the numerators into one another for a new numerator, and the denominators one into another for a new denominator. Again, for division, when the divisor is a whole number, divide the numerator of the fraction by the divisor, if it can be done without leaving a remainder, and take the quotient for a new numerator, the denominator remaining the same; or, keeping the numerator as it was, multiply the denominator by the divisor, and take the product for a new denominator; and where the divisor and the dividend are both fractions, having prepared as before directed, multiply the numerator of the dividend into the denominator of the divisor for a new numerator, and multiply the other numerator and denominator together for a new denominator; or, inverting the terms of the divisor, (not of the dividend,) that is to say, making another fraction which has the numerator of the former for a denominator, and *vice versa*, multiply the numerators together for a new numerator, and the denominators together for a new denominator.

After every operation on fractions, whether addition, subtraction, multiplication, or division, it is proper to reduce the fraction which results to its lowest terms, and any improper fraction to an equivalent mixed number. Any compound fraction, or *the fraction of a fraction of a fraction*, is equivalent to a fraction the numerator of which is the product of the numerators of all the fractions expressed by it, and the denominator the product of all the denominators. Hence we may reduce them to simple fractions, take their value, and, consequently, operate on them as on other fractions.

The whole subject of fractions, the difficulty and the importance of which warrant a very thorough discussion, may be farther explained or recapitulated.

An integral quotient is often incomplete, because, after division, there is a certain portion of the dividend remaining, which is less than the divisor, and, therefore, in its whole state, not divisible by it. But the division may be effected, and, consequently, the quotient made complete, on the principle of a unit being conceived broken into parts, and these being subjected to the same operations which are performed on whole numbers. Now, the supplement, or fractional appendage of quotients, must express, not only the fact of there being such a remainder, but also what portion of it belongs to, or forms a component part of the quotient. Thus, the numerator, which is, in fact, the remainder, may be deemed to be a number that is to be divided into equal parts by the denominator, which, again, is in fact the divisor, and, therefore, the whole of the fraction expresses one of those parts. For example, in the case of 4, considered, suppose, as the remainder of 659 divided by 5, which gives 131 for an integral but only partial quotient, we have for the fractional supplement $\frac{4}{5}$, which signifies that four is to be divided into 5 equal parts, and that one of these parts, or, as it might be expressed, $\frac{1}{5}$ of 4, that is, a fifth part of 4, is to be taken into the quotient. A fraction, therefore, is equivalent to the quotient of the numerator as divided by the denominator; and it is indifferent whether we conceive an integer to be divided into so many number of parts, 5 for example, and four of those parts to be taken, or 4 integers to be divided into five parts, and one of them taken. In the former example, four of those parts are 4 times as much as 1 of the same parts, their magnitude being the same; and in the latter, the one part taken is also 4 times as much as one of the parts in the other, the magnitude of the whole to be divided in the latter, namely 4 integers, being 4 times as much as the whole, that is to say, one integer to be divided in the former case. These two quantities, then, being each 4 times a fifth part of an integer, are equal; and hence $\frac{4}{5}$ of $1 = \frac{1}{5}$ of 4, both being 4 times a fifth of 1.

This will be made quite apparent by conceiving all the integers represented by dots placed under each other, making four lines of five dots each. For it is quite evident that four of these dots, taken, for example, on the first line, to represent $\frac{4}{5}$ of one integer, are equal to all the dots, namely four, on one of the vertical lines, which will represent $\frac{1}{5}$ of the four integers.



Increasing the numerator and diminishing the denominator of a fraction have the same effect in augmenting it; for it is evidently indifferent whether the quantity of any thing that is to be divided be made more, or the number of shares into which it is divided be made less. On the other hand, to diminish the numerator and to increase the denominator, have a like operation in lessening the fraction; for the effect of augmenting the number of shares is the same as that of lessening the quantity that is to be divided. It follows, that to multiply or divide, to add to or take from both numerator and denominator, in an equal degree, or by means of the same number, is to leave the value of the fraction precisely what it was; for any increase or diminution thereby effected is counteracted at the same time and to the same amount.

Such are the principles on which the chief operations with fractions depend. We reduce them to lower dimensions, without altering their value, by dividing numerator and denominator by a number which exactly measures both, and which, on this account, is called a *common measure*, and the discovery of which is necessarily of high importance in many operations. The mode of making it results from two very evident considerations, namely, that any number which measures two others must also measure their sum and their difference, and that a number which measures another must also measure any multiple of it by an integral number. Consequently, to find the common measure of two numbers, it is sufficient to obtain from them successively smaller numbers which shall also contain the same measure, or, in other words, successively to decompose the numbers. When the fraction is not capable of being reduced, the process of repeated decomposition terminates in unit as the only common divisor, and this necessarily measures every number.

Decimal Fractions.—Here unity is supposed to be divided into ten equal parts, and every one of these parts into other ten equal parts, and so on *ad infinitum*; and, accordingly, the denominator to a decimal fraction is always 10, or some multiple of 10; and it is not written down, because the position of the numerator, reckoned from units, of itself indicates the degree of the denominator. For example, 3·7 is $3\frac{7}{10}$, and 6.05 is $6\frac{5}{100}$. The whole of the notation of decimals may be soon understood from the following table, which exhibits the regular decrease by tens, from millions of integers to millionths of fractional parts.

	Whole Numbers.							Decimal Parts.						
&c.	6	5	4	3	2	1	0,	1	2	3	4	5	6	&c.
	Millions.	Hundreds of thousands.	Tens of thousands.	Thousands.	Hundreds.	Tens.	Place of unit.	ten.	hundred.	a thousand.	ten thousand.	hundred thousand.	Parts of a million.	

From this table it appears, that as whole numbers increase by tens, at every removal of place from unity towards the left hand, so, in decimals, every removal towards the right hand is a decrease in the same proportion; or, to express this truth in a different way, quantity, as represented by numbers, decreases in value at every change of position from the highest conceivable degree above unity towards the left hand, to the lowest conceivable degree below unity towards the right hand; and hence, it seems, decimal fractions bear a near relation to whole numbers, each rank of which, in reality, is decimal in respect to those ranks that are higher. For example, in the sum 666, the 6 at the right hand is ten times less in value than the 6 to the left of it, which, again, is ten times less in value than the first on the left; and the same thing might be said of any other series. Consequently, any one of all of these might be taken either as integers or parts of an integer. If considered all as the former, they are put down, and variously operated on, without any point of separation between them; but if partly integer and partly fractional, a comma is used, for distinction sake, to denote the point of difference, which may be after the first figure, or any other figure, according to their respective value. Thus 6,66. signifies 6 units and 66 hundred parts of a unit; 66,6 signifies 66 integers and 6 tenths of an integer; 666,006 signifies 666 integers and 6 thousand parts of an integer. Whence it is evident, that decimal parts take their denomination from the place of their last figure, as

$$\left.\begin{array}{l} ,6 = \frac{6}{10} \\ ,64 = \frac{64}{100} \\ ,642 = \frac{642}{1000} \end{array}\right\} \text{Parts of an unit;}$$

and hence, contrary to the notation of whole numbers, the insertion of cyphers to the left of decimals, that is to say, cyphers prefixed to the figures, decrease their value, but have no effect if placed to the right of them. Thus, ,6 and ,60, and ,600 are all of equal value, being quite the same as $\frac{6}{10}$ of unit; but ,06 = $\frac{6}{100}$, and ,006 = $\frac{6}{1000}$ parts of unit. So that, generally, the true value of decimals is known by their distance from the place of units. This principle being well understood, the operations on decimals will give little trouble.

To add and subtract decimals.—Treat them in every respect as whole numbers, till the proper operation be completed; when, from the sum, or the difference, as many parts are to be marked off for decimals as there are such in any of the given numbers. It is necessary in the process to place every figure directly underneath those figures that are of the same value, whether these be whole numbers or decimal parts, and precisely according to their degree; and for this purpose, it is often advisable to fill up some places with cyphers, which will guide the eye in the operation.

For the *multiplication* of decimals, proceed as in whole numbers, and from the product cut off, or mark as decimals, as many places as there are in both the factors together. The reason of this rule plainly follows from the nature of multiplication as formerly explained in the case where cyphers are attached to integers. For example, 4000 × 200 = 800000; that is, as many cyphers are added as are found in both the factors.

The common rule for the *division* of decimals is to divide as in whole numbers, and then to point off from the right hand of the quotient as many figures for the decimals as the decimal places in the dividend exceed those in the divisor. Should there not be figures enough in the quotient for this purpose, the deficiency is to be supplied by adding cyphers to the left hand. The divisor and the quotient together must have as many decimal places as those in the dividend; and consequently, if there be the same number in the divisor as in the dividend, there can be none in the quotient. If, again, there be more in the dividend, the quotient will have as many as the excess of those in the dividend above those in the divisor: and, lastly, should the divisor have more than the dividend, the deficiency must be made up before dividing, and then the quotient will altogether consist of whole numbers. A particular method of determining the position of the decimal point, deduced from the way of working, is often given, and it is to this effect, namely, the first figure of the quotient is of the same value with that figure of the dividend which stands over units in the first product; or, that the first figure of the quotient is always at the same distance from the decimal point as the figure of the dividend which is over the unit place of the first product. The rationale of the operation will be understood, by considering that the quotient figure is always of the same value or degree with that figure of the dividend under which is the units place of its product; or the rule may be deduced from what is known of the nature of division, namely, that if the divisor be multiplied with the quotient, any remainder being added, the product will be the dividend.

Vulgar fractions may be changed into equivalent decimals in this way. Divide the numerator, with cyphers added to it, by the denominator: and the quotient will give decimal parts either entirely equal, or as nearly equal as may be thought necessary, and which ought to consist of as many figures as these cyphers added to the numerator; for which purpose, it is sometimes necessary, after division, to add cyphers to the left hand of the quotient. Again, to turn decimals into fractions proceed thus: Put 1, with as many cyphers after it as there are figures in the decimal, for a *denominator*, and then reduce the fraction to its lowest terms in the usual way. The theory here must be easily recognized.

It has been observed, in considering the nature of fractions, that numbers are diminished by being multiplied by fractions, and increased when divided by them; whence it follows, that multiplication by fractions has the same effect as dividing by integers, and division by fractions the same effect as multiplying by integers. Now, as there is a corresponding fraction to every integer, that is to say, one which multiplying or dividing has an equivalent opposite effect to that of the integer, so every integer has a corresponding decimal which may be used in the same way. This has obtained the name of the *reciprocal* of the number, and it is so often of use that a rule for finding it is required. Divide, then, 1, with cyphers added to it, by the number, and the quotient is the reciprocal. This operation frequently performed will give great insight into the nature of decimals, and is therefore recommended to the studious reader.

Some decimals are interminable, or can never be completed, though extended to any number of places; and others, which are not interminable, consist, notwithstanding, of so many places, as to be found very inconvenient in practice. But, in either case, it is often quite enough to use three or four places, and so the rest may be omitted without any material effect on the result, which, however, can only be reckoned an approximation.

ALGEBRAICAL QUANTITIES may be subjected to all the operations of which we have now treated; and we therefore proceed to consider them as so affected.

Addition.—The general rule for this operation directs, 1. To arrange all the quantities of the same denomination underneath one another, or so that they may be easily combined; 2. To place the others at length in the first line, and to supply their places with asterisks, or other unmeaning characters, in those lines where they are not found; 3. To add together the numeral *co-efficients* of those quantities which are of the same denomination, recollecting, that if they are both of the same sign, whether positive or negative, their co-efficients must be arithmethically combined, as in ordinary addition, the common sign being prefixed to their sum; but that, if they have unlike signs, then all the affirmative co-efficients are to be taken together, and all the negatives into another sum, and the less of these, which ever it be, is then to be taken from the greater, and the sign thereof, whether positive or negative, prefixed to their difference, which in this case is their sum: And, 4thly, to set down in regular order, with their proper signs, those quantities which are of different denominations, and which, consequently, can in no other way be added together. In practising this rule, the theory of which, it is presumed, must be quite intelligible to any one who has read the preceding pages with attention, it is generally advisable first to determine the signs of algebraic quantities, then their co-efficients, and, lastly, the letters of which they consist. Some progressive examples, which ought to be perfectly understood before another step be taken, will completely enlighten the student on the subject of this operation. Thus,

$$(1.)\quad a + a = 2a, \text{ or } \begin{array}{r} a \\ a \\ \hline 2a \end{array}$$

$$(2.)\quad -a - a = -2a, \text{ or } \begin{array}{r} -a \\ -a \\ \hline -2a \end{array}$$

$$(3.)\quad 4ab + 6ab = 10\,ab, \text{ or } \begin{array}{r} 4\,ab \\ 6\,ab \\ \hline 10\,ab \end{array}$$

$$4.)\quad -3bc - bc = -4\,bc, \text{ or } \begin{array}{r} -3bc \\ -bc \\ \hline -4bc \end{array}$$

$$(5.)\ \begin{array}{r} 6a + 4b \\ 3a + 2b \\ \hline 9a + 6b \end{array} \qquad (6.)\ \begin{array}{r} 4ab - 5cd \\ 7ab - 3cd \\ \hline 11ab - 8cd \end{array} \qquad (7.)\ \begin{array}{r} 5ab - 7 \\ 4ab - 5 \\ \hline 9ab - 12 \end{array}$$

$$(8.)\ \begin{array}{r} 12ab \\ -3ab \\ \hline 9ab \end{array} \qquad (9.)\ \begin{array}{r} 4ab + 9cd \\ -3ab - 8cd \\ \hline ab + \ cd \end{array} \qquad (10.)\ \begin{array}{r} -8a \\ +5a \\ \hline -3a \end{array}$$

$$(11.)\ \begin{array}{r} -11abd \\ +\ 9abd \\ \hline -\ 2abd \end{array} \qquad (12.)\ \begin{array}{r} 5a - 3b \\ -3a + 5b \\ \hline 2a + 2b \end{array}$$

$$(13)\ \begin{array}{r} -\ 6ab - \ 5bc + 13 \\ +10ab - 10bc + \ 7 \\ \hline 4ab - 15bc + 20 \end{array} \qquad (14.)\ \begin{array}{r} -10ab - 10bc - 10 \\ +12ab + 10bc + 20 \\ \hline 2ab + \ * \ + 10 \end{array}$$

$$\begin{array}{lr} (15.) & 3ab + 7bc + 10 \\ & -10ab - 7bc - 10 \\ \hline & -7ab \quad {*}{*} \quad {*}{*} \end{array}$$

$$\begin{array}{ll} (16.) & 3a + b - 12c + 6d \\ & -5e + 7f \\ \hline & 3a + b - 12c + 6d - 5e + 7f. \end{array}$$

$$\begin{array}{lr} (17.) & 4a + 4b - 2ab - c \\ & -8a - 6b + 10ab + d - 54 \\ \hline & -4a - 2b + 8ab - c + d - 54 \end{array}$$

$$\begin{array}{ll} (18.) & 6a + 8abc - 2b + 15 \\ & -3a - 2abc + 4b \\ & -2a - 6abc - 2b - 6 \\ \hline & a + 9 \end{array}$$

$$\begin{array}{ll} (19.) & 7m + 3n - 14p + 17r \\ & 3a + 9n - 11m + 2r \\ & 5p - 4m + 8n - 2b \\ & 11n - m - r + s \\ \hline & 31n - 9m - 9p + 18r + 3a - 2b + s \end{array}$$

$$\begin{array}{ll} (20.) & 11bc + 4ad - 8ac + 5cd \\ & 8ac + 7bc - 2ad + 4mn \\ & 2cd - 3ab + 5ac + an \\ & 9an - 2bc - 2ad + 5cd \\ \hline & 16bc + 5ac + 12cd + 4mn - 3ab + 10an \end{array}$$

It must be very evident from some of these examples, that the word addition is inaccurately applied to the operation thus performed on them, or must be taken in a qualified sense; for in them, it may be said, we have, according to the rule, subtracted quantities from one another, and not added them together. But there can be no difficulty in understanding the matter, if it is considered that though two or more quantities of the same quality can be combined together in the ordinary method of arithmetical addition, so that those which are negative shall be brought into one sum, as well as those which are positive, both being equally real, yet, as possessing opposite qualities, it is impossible to conceive them as entering into any union otherwise than by constituting a quantity which shall be equivalent to their difference, or, in other words, subtracting the less from the greater, as directed, and prefixing the sign of that one which exceeds. We have, therefore, merely to extend the signification of the word addition, so as to imply *incorporation, junction,* or, as some writers, taking a mercantile view of the matter, have proposed, *striking a balance,* in order to get rid of any ambiguity or apparent paradox. "Il est clair," says Bossut, very concisely and neatly, "qu'en algèbre *ajouter* ne signifie pas toujours *augmenter.* Quand j'ajoute un bien avec un bien, j'augmente le bien; de meme, quand j'ajoute une dette avec un dette, j'augmente la dette. Mais quand je joins un bien avec une dette, je *diminue* réellement l'une ou l'autre quantité.' It follows, that an algebraical quantity may be made less by the addition and greater by the subtraction of another quantity.

The general rule for the *subtraction* of algebraical quantities is a very simple one, namely, to change or to suppose changed, all the signs of the quantities which are to be subtracted, and to add them so changed to the quantities from which they were to be subtracted. The reason is quite plain. To subtract an affirmative quantity from an affirmative, is just the same as to add a negative quantity to an affirmative; and to subtract a negative quantity from an affirmative, is the same as to add an affirmative quantity to an affirmative; or, generally, to subtract any quantity, whether positive or negative, is the same as to add one of equal amount but of opposite kind. Accordingly, the word subtraction in algebra, like that of addition, must be taken in a wider sense than what is attached to it in common language; and as, in the use of symbols, arithmetical subtraction is impossible, it is necessary, when we have to subtract an affirmative quantity, to write down the same quantity with the negative sign, and when we have to subtract a negative quantity to put it down with the positive sign, and then in both cases to proceed to algebraic addition. The following examples will illustrate the rule and these observations on it:

(1.) From $+3a$ take $+2a$;

$$\begin{array}{r} 3a \\ -2a \\ \hline a \end{array}$$

(2.) From $+3a$ take $-2a$;

$$\begin{array}{r} +3a \\ +2a \\ \hline 5a \end{array}$$

(3.) From $+5a$ take $+3a$;

$$\begin{array}{r} 5a \\ -3a \\ \hline 2a \end{array}$$

(4.) From $5a + 4b$ take $3a - 2b$;

$$\begin{array}{r} 5a + 4b \\ -3a + 2b \\ \hline 2a + 6b \end{array}$$

(5.) From $8a - 7b$ take $3a + 4b$;

$$\begin{array}{r} 8a - 7b \\ -3a - 4b \\ \hline 5a - 11b \end{array}$$

$$\begin{array}{lr} (6.) & -2a \\ & +3a \\ \hline & -5a \end{array} \qquad \begin{array}{lr} (7.) & -14ab \\ & -7ab \\ \hline & -7ab \end{array} \qquad \begin{array}{lr} (8.) & 6ab + 24 \\ & 3ab + 12 \\ \hline & 3ab + 12 \end{array}$$

$$\begin{array}{lr} (9.) & 3a + 4b \\ & -4a - 3b \\ \hline & 7a + 7b \end{array} \qquad \begin{array}{lr} (10.) & 3ab + 15 \\ & -9ab + 3 \\ \hline & 12ab + 12 \end{array} \qquad \begin{array}{lr} (11.) & -4ab - 2 \\ & -12ab - 6 \\ \hline & 8ab + 4 \end{array}$$

$$\begin{array}{lr} (12.) & 4a - 12 \\ & -4a - 8b + 8 \\ \hline & 8a + 8b - 20 \end{array} \qquad \begin{array}{lr} (13.) & 9bc + 6de \\ & 9bc - 8de \\ \hline & 14de \end{array}$$

$$\begin{array}{lr} (14.) & a + d + 30 \\ & b - 4d + 10 \\ \hline & a - b + 5d + 20 \end{array} \qquad \begin{array}{lr} (15.) & a + b - 60 \\ & d - 7b - bc - 40 \\ \hline & a + 8b + bc - d - 20 \end{array}$$

$$\begin{array}{ll}
\text{(16.)} & 84 \\
 & -a-b-3c+4 \\ \hline
 & a+b+3c+80
\end{array}
\qquad
\begin{array}{ll}
 & 0 \\
\text{(17.)} & 5ab-3cd \\ \hline
 & -5ab+3cd
\end{array}$$

$$\begin{array}{ll}
\text{(18.)} & 6a-9b+4c \\
 & 4d+7e+11f \\ \hline
 & 6a-9b+4c-4d-7e-11f
\end{array}$$

$$\begin{array}{ll}
\text{(19.)} & 17a+2m-9b-4c+23d \\
 & 51a-27b+11c-4d+4m \\ \hline
 & -34a+18b-15c+27d-2m
\end{array}$$

$$\begin{array}{ll}
\text{(20.)} & 8ab-5ac+9bc-8am \\
 & 2ab+11ac-3bc+4am+n-o+114 \\ \hline
 & 6ab-16ac+12bc-12am-n+o-114
\end{array}$$

In order to understand the rule for the *multiplication* of algebraical quantities, which, so far as the signs are concerned, frequently occasions doubt and perplexity to the student, it is requisite to remember that the operation itself is essentially a continuous addition, in the algebraic sense of that word; the multiplier, if positive, denoting how many times the multiplicand is to be added together or conjoined with the other quantities of the problem, or, if negative, how many times it is to be subtracted from the other quantities. If then, in the first case, the multiplicand be also positive, the product must be so too; And if negative, the product must be negative: again, if, in the second case, that is, where the multiplier is negative, the multiplicand is positive, the product is negative; and, lastly, where both are negative, the product is positive. Hence, the brief rule for the signs is, when they are like, that is, either both positive or both negative, the product is positive; and when they are unlike, the product is negative, *i. e.* like signs give +, and unlike signs — in the product. That + into + should give + is easily to be conceived; for multiplication of a positive number by a positive number implies continued addition; and, accordingly, $+a$ multiplied by $+b$, that is, $+a$ taken as often as the units in $+b$, gives $+ab$. Again, that — into + gives — is plain; for $-a$ multiplied by $+b$ denotes that $-a$ is to be taken as often as there are units in b, and consequently the product is $-ab$; or $+a$ multiplied by $-b$ denotes, as multiplication by a negative implies continued subtraction, that $+a$ is to be subtracted as often as there are units in b, and, consequently, the product is $-ab$; for as $+a-a=o$, one of these quantities destroying the other, so their product by b, namely, $+ab-ab$, must $=o$; wherefore $-a$ multiplied by $+b$ gives $-ab$; and, in like manner, $+a$ multiplied by $-b$ gives $-ab$. Lastly, that — into — gives +, may be shown thus: $-a$ to be multiplied by $-b$, denotes that $-a$ is to be subtracted as often as there are units in b; but, according to the rule for subtraction, to subtract $-a$ is the same thing as to add $+a$, and, consequently, the product is $+ab$; or, if we multiply $+a-a=o$ by $-b$, we have for the first term of the product $-ab$, and for the latter, necessarily, $+ab$, these two destroying each other, or their amount being $=o$; and, therefore, $-a$ multiplied by $-b$ gives $+ab$. These things being understood, the rule for multiplication may be proceeded in. When the quantities to be multiplied are simple, find the sign of the product as above, after which, place the product of the numeral co-efficients, and, lastly, set down the letters as if forming one word.

Examples.

$$\begin{array}{lll}
\text{(1.) Mult.} & +a \\
\text{by} & +b \\ \cline{2-2}
 & +ab
\end{array}
\qquad
\begin{array}{ll}
\text{(2.) Mult.} & -4a \\
\text{by} & +4b \\ \cline{2-2}
 & -16ab
\end{array}$$

$$\begin{array}{ll}
\text{(3.) Mult.} & +ac \\
\text{by} & -bd \\ \cline{2-2}
 & -abcd
\end{array}
\qquad
\begin{array}{ll}
\text{(4.) Mult.} & -12ab \\
\text{by} & -3cd \\ \cline{2-2}
 & 36abcd
\end{array}$$

When the quantities are compound, multiply every part of the multiplicand by all the parts of the multiplier taken in order, determine the signs, and collect all the particular products, as formerly directed; their sum will be the product required.

Examples.

$$\begin{array}{ll}
\text{(1.) Mult.} & 3a+6b \\
\text{by} & 7a+7b \\ \cline{2-2}
 & 21ca+42ab \\
 & \phantom{21ca+{}}21ab+42bb \\ \cline{2-2}
 & 21aa+63ab+42bb \\ \cline{2-2}
\end{array}$$

$$\begin{array}{ll}
\text{(2.) Mult.} & 3a-3b \\
\text{by} & 5a+5b \\ \cline{2-2}
 & 15aa-15ab \\
 & +15ab-15bb \\ \cline{2-2}
 & 15aa\ldots\ldots\ldots15bb \\ \cline{2-2}
\end{array}$$

$$\begin{array}{ll}
\text{(3.) Mult.} & a+b-c \\
\text{by} & a-b \\ \cline{2-2}
 & aa+ab-ac \\
 & -ab-bb+bc \\ \cline{2-2}
 & aa\ldots o\ldots-ac-bb+bc \\ \cline{2-2}
\end{array}$$

$$\begin{array}{ll}
\text{(4.) Mult.} & 6a-3b-c \\
\text{by} & 4a-2b-c \\ \cline{2-2}
 & 24aa-12ab-4ac \\
 & -12ab+6bb+2bc \\
 & -6ac+3bc+cc \\ \cline{2-2}
 & 24aa-24ab-10ac+6bb+5bc+cc \\ \cline{2-2}
\end{array}$$

$$\begin{array}{ll}
\text{(5.) Mult.} & aa-ab+bb \\
\text{by} & a+b \\ \cline{2-2}
 & aaa-aab+abb \\
 & +aab-abb+bbb \\ \cline{2-2}
 & aaa\ldots\ldots\ldots+bbb \\ \cline{2-2}
\end{array}$$

Algebraic Arithmetic.

$$\begin{array}{ll} \text{(6.) Mult.} & ab + de \\ \text{by} & -c - f \\ \hline & -abc - cde \\ & \qquad -abf - def \\ \hline & -abc - abf - cde - def \\ \hline \end{array}$$

$$\begin{array}{ll} \text{(7.) Mt.} & aa - 4ab + 6cd \\ \text{by} & -4ac - 2d \\ \hline & -4aaac + 16aabc - 24accd \\ & \qquad -2aad + 8abd - 12cdd \\ \hline & -4aaac + 16aabc - 24accd - 2aad + 8abd - 12cdd \\ \hline \end{array}$$

$$\begin{array}{ll} \text{(8.) Mt.} & 2aa - 4bd + ce \\ \text{by} & -4aa + 3bd - 7ce \\ \hline & -8aaaa + 16aabd - 4aace \\ & +6aabd - 12bbdd + 3bcde \\ & -14aace + 28bcde - 7ccee \\ \hline & -8aaaa + 22aabd - 18aace - 12bbdd + 31bcde - 7ccee \\ \hline \end{array}$$

$$\begin{array}{ll} \text{(9). Mt.} & -5aab + abb - cdd + 8fgh \\ \text{by} & -9ab + 4ff - 15mn + 9cd \\ \hline & +45aaabb - 9aabbb + 9abcdd - 72abfgh \\ & -20aabff + 4abbff - 4cddff + 32fffgh \\ & +75aabmn - 15abbmn + 15cddmn - 120fghmn \\ & -45aabcd + 9abbcd - 9ccddd + 72cdfgh \\ \hline & 45aaabb - 9aabbb + 9abcdd - 72abfgh - 20aabff \\ & +4abbff - 4cddff + 32fffgh + 75aabmn \\ & -15abbmn + 15cddmn - 120fghmn \\ & -45aabcd + 9abbcd - 9ccddd + 72cdfgh \\ \hline \end{array}$$

It is sometimes convenient not to perform the operation of multiplying algebraic quantities, but merely to indicate that they are to be multiplied, or that their product is understood to be taken. This is done by setting them down with the sign of multiplication between them; as $a \overline{+ b} \times c \overline{+ d}$ expresses the product of $a + b$, taken together, multiplied by $c + d$, also taken together, both these compound quantities being under the *vinculum*: or a better plan, because the vinculum is liable to be drawn either too long or too short, so as to lead to error, is, to enclose the quantities within brackets thus, $(a + b - 8)$ $(c + d - 4)$ indicates the product of the complex quantity $a + b - 8$ by the complex quantity $c + d - 4$.

The products of the same quantity, multiplied by itself, are called the *powers* or dimensions of that quantity, which itself is considered as the root whence they spring; and these powers have different denominations accordingly as they are the result of one multiplication or of several multiplications, and are often expressed by placing over the root, to the right hand, a small figure, called an *index* or *exponent*, which signifies how many times the root is repeated. Thus, any number being considered its first power, the product of it, by a single multiplication of itself, is the *second power*, or, as it is often called, the *square*; the product of this by the number itself, or the multiplication of the number for three times, is the *third power*, or *cube*; and so on, according to the following table, which is applicable both to common arithmetic and the powers of an algebraic monomial:

Names of the Powers.	Root, or 1st Power.	Square, or 2d Power.	Cube, or 3d Power.	Biquadrate, or Square Squared, being the 4th Power.	Sursolid, or 5th Power.	Square Cubed, or Cube Squared, being the 6th Power.	The Second Sursolid, or 7th Power.	The Biquadrate squared, or 8th Power.	The Cube Cubed, or 9th Power.
Indices or Exponents.		(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Numbers, and their powers.	1	1	1	1	1	1	1	1	1
	2	4	8	16	32	64	128	256	512
	3	9	27	81	243	729	2187	6561	19683
	4	16	64	256	1024	4096	16384	65536	262144
	5	25	125	625	3125	15625	78125	390625	1953125
	6	36	216	1296	7776	46656	279936	1679616	10077696
	7	49	343	2401	16807	117649	823543	5764801	40353607
	8	64	512	4096	32768	262144	2097152	16777216	134217728
	9	81	729	6561	59049	531441	4782969	43046721	387420489
	10	100	1,000	10,000	100,000	1,000,000	10,000,000	100,000,000	1,000,000,000
	a	a^2	a^3	a^4	a^5	a^6	a^7	a^8	a^9

The operation by which these powers are obtained is called INVOLUTION, and it is in every respect the same as multiplication, save that it retains always the same multiplier, namely, the original number, whereas multiplication admits of different multipliers. If the algebraic quantities have numeral co-efficients, these must be involved as well as the quantities. Thus $2a$ raised to the second power is $4a^2$, to the third power, $8a^3$, to the fourth $16a^4$. Involution of compound algebraic quantities is performed in a similar manner, due regard being always paid to the signs and co-efficients. Thus $a + b$ raised to the second power or square is $a^2 + 2ab + b^2$, to the third power or cube is $a^3 + 3a^2b + 3ab^2 + b^3$, &c. as may be easily shewn, for

$$\begin{array}{l}
a + b \\
a + b \\
\hline
a^2 + ab \\
\qquad ab + b^2 \\
\hline
a^2 + 2ab + b^2 \text{ the square,}
\end{array}$$

and this product multiplied again by $a + b$, gives the cube as above, namely,

$$\begin{array}{l}
a^2 + 2ab + b^2 \\
a + b \\
\hline
a^3 + 2a^2b + ab^2 \\
\qquad a^2b + 2ab^2 + b^3 \\
\hline
a^3 + 3a^2b + 3ab^2 + b^3
\end{array}$$

Suppose the same compound quantity or binomial raised to the fifth power, we may find it thus, proceeding in the same manner:

$$\begin{array}{l}
a + b \\
a + b \\
\hline
a^2 + ab \\
\qquad ab + b^2 \\
\hline
a^2 + 2ab + b^2 \text{ the square.} \\
a + b \\
\hline
a^3 + 2a^2b + ab^2 \\
\qquad a^2b + 2ab^2 + b^3 \\
\hline
a^3 + 3a^2b + 3ab^2 + b^3 \text{ the cube.} \\
a + b \\
\hline
a^4 + 3a^3b + 3a^2b^2 + ab^3 \\
\qquad a^3b + 3a^2b^2 + 3ab^3 + b^4 \\
\hline
a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + b^4, \\
a + b \qquad\qquad\qquad\qquad \text{the fourth power.} \\
\hline
a^5 + 4a^4b + 6a^3b^2 + 4a^2b^3 + ab^4 \\
\qquad a^4b + 4a^3b^2 \quad 6a^2b^3 + 4ab^4 + b^5 \\
\hline
a^5 + 5a^4b + 10a^3b^2 + 10a^2b^3 + 5ab^4 + b^5 \\
\qquad\qquad\qquad\qquad \text{the fifth power required.}
\end{array}$$

Again, let $a - b$ be raised to the same power.

$$\begin{array}{l}
a - b \\
a - b \\
\hline
aa - ab \\
\quad - ab + b^2 \\
\hline
aa - 2a^2b + b^2 \text{ the square.} \\
a - b \\
\hline
a^3 - 2a^2b + ab^2 \\
\qquad a^2b + 2ab^2 - b^3 \\
\hline
a^3 - 3a^2b + 3ab^2 - b^3 \text{ the cube.} \\
a - b \\
\hline
a^4 - 3a^3b + 3a^2b^2 - ab^3 \\
\quad - a^3b + 3a^2b^2 - 3ab^3 + b^4 \\
\hline
a^4 - 4a^3b + 6a^2b^2 - 4ab^3 + b^4 \text{ the fourth power.} \\
a - b \\
\hline
a^5 - 4a^4b + 6a^3b^2 - 4a^2b^3 + ab^4 \\
\qquad a^4b + 4a^3b^2 - 6a^2b^3 + 4ab^4 - b^5 \\
\hline
a^5 - 5a^4b + 10a^3b^2 - 10a^2b^3 + 5ab^4 - b^5, \text{ the fifth power required.}
\end{array}$$

Now, comparing these examples of involution in the first of these cases viz. $a + b$, where the sum of two quantities is taken, and $a - b$, called a *residual* root, where the difference of two quantities is taken, we may deduce the following particulars. 1. That the powers of a residual root are the same with those of a binomial root, except in their signs, which in the former case are alternately positive and negative, whereas in the latter they are throughout positive. 2. That the indices or exponents of the leading quantity, in both cases, a, continually decrease by units, whilst those of the other quantity, namely, in both cases, b, continually increase in the same manner,—so that we have successively in the one a^5, a^4, a^3, a^2, a, and in the other b, b^2, b^3, b^4, b^5. 2. That the first and the last term are always pure powers of the single quantities, that is, have no co-efficients, and consist each of one term only, and are both of the same dimension; thus a^5 and b^5: And 3. That the sum of the indices of any two of the letters found in any intermediate term are always equal to the index of the highest power, namely, that of the first or the last term. Recollecting these particulars, it will be easy to determine the order both of the letters and the indices of any powers of either a binomial or residual root.

The multiplication of powers of the same root is effected by adding their exponents or indices. Thus, $a^2 \times a^3 = a^5$, or $aa \times aaa = aaaaa$.

In general, if $a + b$ is to be raised to any power, as m, the terms, without their coefficients, will be a^m, $a^{m-1}b$, $a^{m-2}b^2$, $a^{m-3}b^3$, $a^{m-4}b^4$, &c. continued till the exponent of b becomes equal to m. And the co-efficients of the respective terms are, 1, m, $m \times \frac{m-1}{2}$, $m \times \frac{m-1}{2} \times \frac{m-2}{3}$, $m \times \frac{m-1}{2} \times \frac{m-2}{3} \times \frac{m-3}{4}$, $m \times \frac{m-1}{2} \times \frac{m-2}{3} \times \frac{m-3}{4} \times \frac{m-4}{5}$, &c. continued till we have one co-efficient more than there are units in m; whence it follows, that $\overline{a + b}^{\,m} = a^m + ma^m - 1b +$

$m \times \frac{m-1}{2} \times a^{m-2} b^2 + m \times \frac{m-1}{2} \times \frac{m-2}{3} \times a^{m-3} b^3 + m \times \frac{m-1}{2} \times \frac{m-2}{3} \times \frac{m-3}{4} \times a^{m-4} b^4$, &c.; and this, accordingly, is the general rule and formula for raising a binomial quantity to any power m.

A quantity consisting of three or more terms may be involved by distinguishing it into two parts, raising it as a binomial to the power required, and then substituting the values of the compound parts. Thus, $\overline{a+b+c}^2 = \overline{\overline{a+b}+c}^2 = \overline{a+b}^2 + 2c \times \overline{a+b} + c^2 = a^2 + 2ab + b^2 + 2ac + 2bc + c^2$, in which case, $a + b + c$ is considered as consisting of the compound part $a + b$, and the simple part c, and treated accordingly; after which the second power of $a + b$, obtained in the usual manner, is substituted for $\overline{a+b}^2$.

Evolution, or the extraction of the roots of powers, is the converse of involution. It is easily performed on algebraic quantities when the powers are single and really have the roots required, namely, by dividing their exponents or indices by the number which denotes the root required. Thus the square root of a^8 is $a^{\frac{8}{2}} = a^4$, and that of a^4b^8 is $a^{\frac{4}{2}}b^{\frac{2}{2}} = a^2b$; the square root of $a^6 b^6$ is $a^3 b^3$, its cube root is a^2b^2, and its fourth root ab. When there are co-officients, these must also have their respective roots extracted. The table, as above, of the powers of the numbers up to 10, will aid us in accomplishing this, even if the required root should consist of more than two figures; and still more so will such a table of the mutual products of numbers given by Mr Leslie, and formerly alluded to. There are also some rules on the subject for which it is necessary that we find room. But it will facilitate the understanding of them if we treat first of algebraic evolution. The powers of any root being found by multiplying its exponent by the index denominating the power, as to raise any simple quantity to its second, third, or other power, is to double, treble, &c., its exponent, or, in general, to raise any quantity to the power expressed by m, is accomplished by multiplying its exponent by m, so the root of any simple quantity is to be had by dividing its exponent by the number denominating the kind of root required. Now, it is evident from what has been said of the signs in multiplication, and the process of involution, that any power that has a positive sign may have either a positive or negative root, if that root is denominated by an even number, as the square root of $+ a^2$ may be $+ a$ or $- a$, seeing that either $+ a \times + a$, or $- a \times - a$, gives $+ a^2$ for the product. But if a power have a negative sign, it is impossible to assign any of its roots that are denominated by an even number, because it is obvious no quantity multiplied into itself an even number of times can give a negative product; and hence such roots are called impossible or imaginary, as, for example, the square root of $- a^2$. When the required root is denominated by an odd number, its sign must be the same as that of the given power whose root is to be extracted, as thus the cube root of $- a^3$ is $- a$. Again, if the number indicating the required root is a divisor of the exponent of the given power, then the root is only a lower power of the same quantity, as the cube root of a^{12} is a^4, the number 3 indicating the required root being a divisor of 12: And farther, if the number indicating the required root is not a divisor of the exponent, the root itself must have a fraction for its exponent, as the square root of a^3 is $a^{\frac{3}{2}}$, and that of a is $a^{\frac{1}{2}}$. Such powers, namely, those which have fractional exponents, are called *imperfect powers*, or *surds*; they are multiplied and divided as other powers, and may be involved and evolved in the same manner.

These things being understood, we proceed to the extraction of the square root of a compound quantity. It is performed thus: Arrange the terms of the given power according to the dimensions of it, beginning at the highest; find the square root of the first term, which gives the first member of the root; subtract its square from the proposed quantity, and divide the first term of the remainder by the double of the first member of the root, and the quotient gives the second member of the root. Add this to the double of the first, multiply this sum by the second member, and subtract the product from the same remainder; then, if nothing remains, the square root consists of the two members already obtained; but if there be a remainder, it must be divided by the double of the sum of these two parts, the quotient forming the third member of the root. For example, to extract the square root of $a^2 + 2ab + b$ — we proceed thus:

$$
\begin{array}{lll}
 & & \text{The root.} \\
(1.) & a^2 + 2ab + b & \big(a + b \\
 & a^2 & \\
\overline{2a + b} \times b & \big) \; 2ab + b & \\
 & \; 2ab + b & \\
 & \overline{\qquad\qquad} &
\end{array}
$$

(2.) To extract the square root of $a^2 + 2ab + 2ac + b^2 + 2bc + c^2$

$$
\begin{array}{ll}
 & \qquad\qquad\qquad\qquad\qquad\qquad \text{The root.} \\
 & a^2 + 2ab + 2ac + b^2 + 2bc + c^2 \; \big(a + b + c \\
 & a^2 \\
2a + b & \big) \; 2ab + 2ac + b^2 + 2bc + c^2 \\
\times b & \big) \; 2ab \qquad\quad + b^2 \\
 & \overline{\qquad\qquad\qquad\qquad} \\
2a + 2b + c & \big) \; 2ac \qquad + 2bc + c^2 \\
\times c & \big) \; 2ac \qquad + 2bc + c^2 \\
 & \overline{\qquad\qquad\qquad\qquad}
\end{array}
$$

The general rule for the extraction of roots, deduced from the principles already explained when treating of involution, is as follows. Arrange the given power according to its dimension, and extract the root required from the first term, which will give the first member of the root. Bring this to a dimension lower by unit than the number indicating the root required; multiply the power thus got by that number, and divide the second term of the given quantity by the product, so as to obtain the second member of the root required, with which proceed as formerly directed. For example, to extract the root or first power of $a^5 + 5 a^4b + 10 a^3b^2 + 10 a^2b^8 + 5 a b^4 + b^5$. Here the root of the 5th power of a^5, the first term, is a, which being raised to the fourth power, and multiplied by 5, gives $5\,a^4$, with which dividing the second term of the given quantity, we obtain b for the second member of the required root; and accordingly raising $a + b$ to the 5th power, and subtracting it, we find there is no remainder, whence we conclude $a + b$ to be the root required. If the root have three members, the third is to be found as already shewn in the case of the square root.

It must be seen from the examples which have been given, that when the sum of several quantities, and it is the same with the difference, is involved in any power, there arise as many single powers of the same dimension as there are different quantities, as for instance, $a + b + d$, raised to any power, suppose m, will have a^m, b^m, d^m. In extracting the roots of compound quantities, therefore, we have always to consider how many different letters there are in the given power, whether the single powers of these letters be of the same dimension, and have such a single root as is required; which done, we may connect those single roots together with the sign $+$, and involve them to the same height as the given power. If the result be the same in terms and signs as the given power, we have obtained the root; or if the terms correspond but not the signs, it is easy to correct the latter; but if the terms should differ, being either more or less than in the given number, we may conclude that power to be a surd, and may express it accordingly.

Example (1.) Suppose there is required the square root of $a^2 + 2\,ab + 2\,ac + b^2 + 2\,bc + c^2$, the compound quantity before operated on. Here there are three distinct powers, namely a^2, b^2, and c^2, the single roots of which are a, b, c; and, accordingly, it may be at once inferred that the root required is $a + b + c$.

(2.) Required the square root of $b^2 + 2\,cb - 2\,bd + c^2 - 2\,cd + d^2$. Here also there are three distinct powers, b^2, c^2, d^2, the single roots of which are b, c, d, and we infer that one of them, namely d, is negative, for it is found with the negative sign in combination with the two other roots; whence we conclude $b + c - d$, to be the required root, and accordingly, on involving it, we find the given power.

(3.) Required the square root of $a^4 - 2a^2\,b + b^4$. Here there are only two single powers, a^4 and b^4, the square roots of which are a^2, b^2. But because in the given power we have—$2a^2b^2$, we infer the roots to be either $a^2 - b^2$, or $b^2 - a^2$, for either of them involved will yield the given power. Accordingly, the nature of the question alone must determine which of them is to be taken.

(4.) Required the cube root of $125a^3 + 300a^2c - 450a^2 + 250ac^2 - 720ac + 64c^3 + 540a - 288c^2 + 432c - 216$. Here we have three distinct powers, namely $125a^3$, $64c^3$, and -216, the cube roots of which are respectively $5a$, $4c$, and -6. Consequently, assuming these together, $5a + 4c - 6$, and involving them to the fifth power, we find the given power produced, whence we conclude them to be the root required.

(5.) Required the cube root of $27a^3 + 54a^2b + 8b^3$. In this example we have two distinct cubes, $27a^3$ and $8b^3$, the cube roots of which are $3a$, $2b$; raising these then to the third power, we obtain $27a^3 + 54a^2b + 36ab^2 + 8b^3$, which exceeds the given power by one term, namely, $36ab^2$; but the new raised power being a perfect cube, it is certain that the given power is imperfect, and hath not such a root as is required.

The reader who comprehends these examples, and the principles delivered on the subject, will now perceive the rationale of the following general rule for the extraction of the roots of numbers, which therefore is left without farther explanation.— Place a point over the units, and over every third, fourth, or other figure towards the left hand, according to the root required; and, in the case of decimals, point them in the same way, proceeding from the place of units towards the right hand. Thus will the given numbers be divided into as many periods as there are figures in the root. Find the greatest power of the first period, the root of which will be the first member of the required root. Subtract its greatest power from the first period, and to the remainder annex the first figure of the second period for a dividend. Raise the first figure thus found to a power less by unit than the power the root of which is required; multiply it by the index of the power, and divide the dividend by the product for the second figure of the root required. The part of the root now found is to be raised to the power the root of which is sought; and if it be less than the two first periods of the given number, the second figure of the root is right, but if greater, the second figure of the root found must be diminished, till the new raised power be made equal to or less than the periods of the given number operated on. Then subtract it therefrom, the remainder being the next period, and so proceed till the whole given number be gone over, the third period being found by means of the two first, as the second was found by the first, the fourth by the three first, and so on. In the event of there being a remainder, the operation may be continued by adding cyphers, and finding the true root in decimals, as correctly as may be desired.

The rule for the signs in *division* is the same as in multiplication, and for this reason, that the quotient must be such a quantity as, when multiplied by the divisor, shall, with any remainder being added, give the dividend. If, then, the signs of the dividend and divisor are like, whether positive or negative, the sign of the quotient must be positive; if the former are unlike, the latter must be negative. The operation of division is to be performed in various ways. 1. Case. When the divisor is simple, and also occurs in, or is a *fraction* of the term or all the terms of the dividend, which is discovered by its numeral co-efficient, if there be one, measuring all the co-efficients of the terms of the dividend, and all its letters being present in all of them, then the letter or letters that are common to both are to be expunged or cast off from the dividend, and the co-efficients of the terms of the dividend are to be divided by the co-efficient of the divisor, when the quantity which remains in the dividend is the quotient. So ab divided by b gives a for a quotient, and $ad + bd$ divided by d, gives $a + b$. To divide $8\,aab + 6\,ab$ by $2ab$, proceeding as directed, we write them down in such a manner as most conveniently to discover their correspondence, namely, by placing the dividend above a line and the divisor below, as in the case of fractions, thus, $\frac{8aab + 6ab}{2\,ab}$, or, as in common division, thus, $8aab + 6ab\underline{|2ab}$, or $2ab)\ 8aab + 6\,ab$ (; when observing the occurrence of *ab*, the literals of the divisor, in both terms of the dividend, we expunge them from the latter, so as to obtain $8a + 6$, the co-efficients of which being divided by 2, the co-efficient of the divisor, we have $4a + 3$, for the quotient; and, accordingly, this multiplied by $2ab$ will give us the dividend, for $4a + 3 \times 2\,ab = 8aab + 6ab$.

2d Case.—When the divisor, though simple, is not a factor of the dividend, or when the quantities of the former cannot be exactly found in the latter, we express the quotient fractionwise, placing, as usual, the dividend above a line, and the divisor below it. So, to divide a by b, we say $\frac{a}{b}$; the quotient of $5ab$ divided by mn is the fraction $\frac{5ab}{mn}$; and that of $9ab + 6cd$ by ef is $\frac{9ab + 6cd}{ef}$. But the numeral co-efficients may admit of reduction, as $\frac{6\,ab}{3mn}$ to $\frac{2ab}{mn}$; and other reductions may be practised, as $\frac{4abc}{2adc}$ to $\frac{b}{d}$, on the general principle which regulates the reduction of fractions.

3d Case.—When the divisor is a compound quantity, we first arrange the terms of the dividend, as also those of the divisor, in the order of the powers or dimensions of the letters common to both, beginning at the highest. Then we divide the first term of the divisor in order to obtain the first term of the quotient, the product of which, with the whole divisor, is to be subtracted from the dividend; the remainder, if any, being arranged in the same order, is next to be proceeded with in like manner, as a new dividend, and the second term of the quotient found, when, as before, we subtract the product of it, with the whole divisor, from this new dividend; and so continue till there be no remainder, or it be discovered that the process is interminable, and that there will always be a remainder, in which case we may add to the quotient, as a fractional part of it, the last remainder as a numerator, and the divisor as a denominator. For example, let us divide $aa + 2ab + bb$, by $a + b$. The operation is performed thus,

$$(1.)\quad \begin{array}{l} aa + 2\,ab + bb \;\Big|\; \dfrac{a+b}{a+b} \\ aa + \;\; ab \\ \hline \qquad ab + bb \\ \qquad ab + bb \\ \hline \end{array}$$

Here the terms are arranged according to the powers of a, and aa, the first term of the dividend, being divided by a, the first term of the divisor, we have a for the first term of the quotient, with which multiplying the whole divisor $a + b$, we obtain the product $aa + ab$, which being subtracted from the dividend, we have $ab + bb$, for a remainder or new dividend; on this operating as before, that is, dividing it by the first term of the divisor, we obtain b for the second term of the quotient, with which multiplying the whole divisor, we get the product $ab + bb$, precisely equal to it, so that there is no remainder; and, therefore, $a + b$ is the full quotient, as may be proved by multiplying it with the divisor, their product being the original dividend, namely, $aa + 2ab + bb$.

(2.) Divide $aaa + 5aax + 5axx + xxx$, by $a + x$.

$$\begin{array}{l} aaa + 5\,aax + 5axx + xxx \;\Big|\; \dfrac{a+x}{aa + 4ax + xx} \\ aaa + \;\; aax \\ \hline \qquad 4aax + 5axx \\ \qquad 4aax + 4axx \\ \hline \qquad\qquad axx + xxx \\ \qquad\qquad axx + xxx \\ \hline \end{array}$$

(3) Divide $3aaa - 12aa - aab + 10ab - 2bb$, by $3a - b$.

$$\begin{array}{l} 3aaa - 12\,aa - aab + 10\,ab - 2bb \;\Big|\; \dfrac{3a - b}{aa - 4a + 2b} \\ 3aaa \qquad\qquad - aab \\ \hline \quad - 12aa \qquad\quad + 10\,ab \\ \quad - 12aa \qquad\quad + \;\; 4\,ab \\ \hline \qquad\qquad\qquad 6ab - 2bb \\ \qquad\qquad\qquad 6ab - 2bb \\ \hline \end{array}$$

(4.) Divide $6aaaa - 96$ by $3a - 6$.

$$\begin{array}{l} 6aaaa - 96 \;\Big|\; \dfrac{3a - 6}{2aaa + 4aa + 8a + 16} \\ 6aaaa - 12aaa \\ \hline \quad + 12aaa - 96 \\ \quad\;\; 12aaa - 24aa \\ \hline \qquad + 24aa - 96 \\ \qquad\;\; 24aa - 48a \\ \hline \qquad\qquad + 48a - 96 \\ \qquad\qquad\;\; 48a - 96 \end{array}$$

(5.) Divide $aaa - 3aab + 3abb - bb$ by $aa - 2ab + bb$.

$$\begin{array}{l} aaa - 3aab + 3abb - bb \;\Big|\; \dfrac{aa - 2ab + bb}{a - b} \\ aaa - 2aab + abb \\ \hline \quad - aab + 2abb - bb \\ \quad - aab + 2abb - bb \\ \hline \end{array}$$

(6.) Divide $aa + 2ab + bb + c$ by $a + b$.

$$\begin{array}{l} aa + 2ab + bb + c \;\Big|\; \dfrac{a+b}{a+b+\dfrac{c}{a+b}} \\ aa + ab \\ \hline \quad ab + bb \\ \quad ab + bb \\ \hline \qquad \dfrac{+c}{a+b} \end{array}$$

(7.) Divide cc by $a+b$

$$\begin{array}{l|l} cc & a+b \\ \hline cc+\frac{bcc}{a} & \frac{cc}{a}-\frac{bcc}{aa}+\frac{bbcc}{aaa}-\frac{bbbcc}{aaaa} \\ \hline -\frac{bcc}{a} & \\ -\frac{bcc}{a}-\frac{bbcc}{aa} & \\ \hline +\frac{bbcc}{aa} & \\ \frac{bbcc}{aa}+\frac{bb\,cc}{aaa} & \\ \hline -\frac{bbbcc}{aaa} & \\ \frac{bbbcc}{aaa}-\frac{bbbbcc}{aaaa} & \\ \hline +\frac{bbbbcc}{aaaa} & \\ \text{\&c. \&c.} & \end{array}$$

In this example, it is evident, the operation might be carried on to infinity; but it is no less evident, that the law of the progression or series of terms in the quotient is already discovered, and hence, without farther division, we may continue the quotient to any number of terms required.

Powers of the same root are divided by subtracting their exponents. Thus aaa, or as it is otherwise expressed, a^3, divided by a gives aa or a^2 for a quotient, and a^5b^4, divided by $a^3\,b^2$, gives $a^2\,b^2$.

Algebraic fractions may be represented and operated on as vulgar fractions. Thus, we place the numerators or dividends above a line, and the denominators or divisors below; if these are equal to each other, the fractions are equal to unity; if the numerator is greater than the denominator, the fraction is greater than unity, and is called improper; but if less than the denominator, the fraction is less than unit, and is *proper*, &c.; and the general principle on which the operations are founded being the same as that of vulgar fractions, the rules for practice are identical. It will be recollected, then, that if the divisor and the dividend, or the denominator and the numerator, be either both multiplied or divided by the same quantity, the quotient remains the same, or the value of the fraction is unaltered; as, if $\frac{a}{b}=C$, then $\frac{da}{db}=C$; and again, if $\frac{da}{db}=C$, then $\frac{a}{b}=C$; that hence a fraction may be reduced to another of the same value, but of a simpler form, by dividing both numerator and denominator by a common measure; as $\frac{a^2c}{bc}$ into $\frac{a^2}{b}$, c being a common measure; $\frac{a^2\,b^3}{abc}$ into $\frac{ab^2}{c}$, ab being a common measure; and $\frac{6ab+12ac}{24ax}$, into $\frac{b+2c}{4x}$, $6a$ being a common measure: that a fraction is multiplied by any number or quantity, by multiplying its numerator, or dividing its denominator thereby; and, on the contrary, that a fraction is divided by a number by dividing its numerator or multiplying its denominator thereby. We can be at no loss now as to the rationale of any of the problems proposed on the subject of algebraic fractions. A selection of examples under the rules will probably, therefore, best aid the reader's advancement.

(1.) Bring the fractions $\frac{a}{b}$ and $\frac{d}{c}$ into one denomination, their value being retained: $a\times c$ and $d\times b$ give the numerators, and $b\times c$ the common denominator; hence we have $\frac{ac}{bc}$, $\frac{db}{bc}$. (2.) The fractions $\frac{a}{b}\ \frac{c}{d}\ \frac{e}{f}$, treated in the same way, are brought to the respectively equal fractions $\frac{adf}{bdf}$, $\frac{bcf}{bdf}$, $\frac{bde}{bdf}$: (3.) And $\frac{b+e}{a+b}$ and $\frac{d-e}{b-d}$ become $\frac{b^2+bc-bd-dc}{ab+b^2-ad-bd}$, $\frac{ad-ae+bd-be}{ab+b^2-ad-bd}$. (4.) The mixed quantity $a+\frac{b}{d}$ brought into the state of fraction will be $\frac{ad+b}{d}$; (5.) $a+b-c+\frac{d-e}{f}$ will be $\frac{af+bf-cf+d-e}{f}$; (6.) $a+b+\frac{a^2+b^2}{a-b}$ will be $\frac{2a^2}{a-b}$, for $\overline{a+b}\times\overline{a-b}=a^2-b^2$, which, added to a^2+b^2, gives $2a^2$. (7.) The whole quantity ab, represented fractionwise, is $\frac{ab}{1}$; or (8.) reduced to a fraction, having m for a denominator, is $\frac{abm}{m}$; and, (9.) $a+b$ reduced to a fraction, having $a-b$ for a denominator, is $\frac{a^2-b^2}{a-b}$. (10.) The fraction $\frac{a^2bc}{dc}$ reduced to its lowest denomination, is $\frac{a^2b}{d}$; (11.) the numerator and denominator of $\frac{75abc}{125bcx}$, being divided by $25bc$, their common measure, become $\frac{3a}{5x}$; 12.) $\frac{a^2-b^2}{a^2-2ab+b^2}$ reduced, is $\frac{a+b}{a-b}$, $a-b$ being the common measure.

The general rule for finding a common divisor, it will be remembered, is to divide the greater quantity by the less, the divisor by the remainder, if any, and any other remainder by the last divisor, till no remainder is left, the last divisor being, in that case, the greatest common measure. Now, it is clear, that any simple factor of all the terms of one of the quantities, that is not also a factor of the other, may be

Algebraic Arithmetic.

taken out, as it cannot possibly affect the required *common* measure. Farther, that, for the same reason, the remainders presented in any part of the operation may be divided by any simple divisor not belonging also to the other quantities, and which, consequently, cannot make any part of the common measure; and that, on a similar principle, in order to make the operation of successive division succeed, any of the dividends may be multiplied by a simple quantity. (13.) Let the fraction, therefore, $\frac{a^3 + ab^2 - a^2b - b^3}{4a^4 - 4a^3b - 2a^2b^2 + 2ab^3}$ be reduced to its lowest terms. Now here we may, in the first place, take out the simple divisor $2a$ from all the terms of the dividend, which consequently becomes $2a^3 - 2a^2b - ab^2 + b^3$, to be divided by $a^3 - a^2b + ab^2 - b^3$, and this gives a quotient 2, and a remainder $-3ab^2 + 3b^3$, which, by its simple divisor $3b^2$ being taken away, becomes $-a + b$, and with this dividing the original divisor, $a^3 - a^2b + ab^2 - b^3$, we obtain the quotient $-a^2 - b^2$ without remainder; whence we conclude $-a + b$ to be the common measure. Accordingly, dividing both numerator and denominator by it, we obtain $\frac{-a^2 - b^2}{-4a^3 + 2ab^2}$, or changing all the signs $\frac{a^2 + b^2}{4a^3 - 2ab^2}$, as the lowest terms of the fraction. (14.) The fractions $\frac{a}{d}$, $\frac{b}{d}$, $\frac{c}{d}$, being added together, make $\frac{a+b+c}{d}$; (15.) The sum of $\frac{a}{b}$, $\frac{c}{d}$, $\frac{e}{f}$, found according to the rule, is $\frac{adf + cbf + bde}{bdf}$; (16.) That of $\frac{a^2}{d}$ and $\frac{b^2}{d}$ is $\frac{(a^2 + b^2)}{d}$; (17.) The difference between $\frac{a}{d}$ and $\frac{b}{d}$, that is $\frac{a}{d} - \frac{b}{d} = \frac{a-b}{d}$ (18.) Between $\frac{a}{b}$ and $\frac{c}{d}$, that is $\frac{a}{b} - \frac{c}{d} = \frac{ad - bc}{bd}$; (19.) The fraction $\frac{a}{b}$ multiplied by $\frac{c}{d}$ gives $\frac{ac}{bd}$; (20.) $\frac{a^2 + b^2}{c + d} \times \frac{a - b}{c - d} = \frac{(a^2 + b^2)}{(c + d} \frac{(a - b)}{(c - d)} = \frac{a^3 + ab^2 - a^2b - b^3}{c^2 - d^2}$; (21.) The fraction $\frac{c}{d}$ divided by $\frac{a}{b}$ gives $\frac{bc}{ad}$; (21. $\frac{b}{cf}$ divided by $\frac{ab}{c} = \frac{abdc}{abcf} = \frac{d}{f}$; (22.) $a^2 + \frac{3ab^2}{a + 4b}$ divided by $a + b = \frac{a^3 + 4a^2b + 3ab}{a^2 + 5ab + 4b^2} = \frac{a^2 + 3b}{a + 4b}$.

We *involve* fractions by raising their numerators and denominators respectively into the powers required, and *evolve* their roots on the same principle. For a reason already mentioned, this last operation may be impossible, neither the numerator nor the denominator having the root required, or sometimes only one of them having it. In these cases, we may either prefix what is called the *radical* sign, viz. $\sqrt{}$, with its index, to the whole fraction, or to the numerator or denominator, as may be needed, to denote the quantities being *surd*, or express them by fractional exponents, the denominators thereof indicating the order or degree of the surd.

Algebraic Arithmetic.

It is often convenient to represent quantities as surds which are really not so; and this is done by reducing their indices to the form of fractions of the same value, or leaving them under the sign. Thus $a = a^{\frac{2}{2}} = \sqrt{a^2}$, and $a^2b = a^{\frac{6}{3}}b^{\frac{3}{3}} = \sqrt[3]{a^6b^3}$. Surds may be added together, or subtracted from each other, when they are of the same kind, by the addition or subtraction of their *rational* part, the surd parts being conjoined with their sum or difference; as, for example, in addition,

$$\begin{array}{ll} (1.) & 6a\sqrt{bc} \\ & 4a\sqrt{bc} \\ \hline & 10a\sqrt{bc} \end{array} \qquad \begin{array}{ll} (2.) & 4b\sqrt{a^2 + c^2} \\ & 6b\sqrt{a^2 + c^2} \\ \hline & 10b\sqrt{a^2 + c^2} \end{array}$$

$$\begin{array}{ll} (3.) & b + \sqrt[3]{a^2 - c^2} \\ & 3b + \sqrt[3]{a^2 - c^2} \\ \hline & 4b + \sqrt[3]{a^2 - c^2} \end{array} \qquad \begin{array}{ll} (4.) & ab\sqrt[5]{d^3 + e^2} \\ & 2ab\sqrt[5]{d^3 + e^2} \\ \hline & 3ab\sqrt[5]{d^3 + e^2} \end{array}$$

In subtraction.

$$\begin{array}{ll} (1.) & 6a\sqrt{bc} \\ & 4a\sqrt{bc} \\ \hline & 2a\sqrt{bc} \end{array} \qquad \begin{array}{ll} (2.) & 4ab\sqrt[5]{c^2 + d} \\ & 3ab\sqrt[5]{c^2 + d} \\ \hline & ab\sqrt[5]{c^2 + d} \end{array}$$

But when surds are unlike, we may express the intended operations on them by the signs; as to add,

$$\begin{array}{ll} (1.) & 4a\sqrt{b} \\ & 2d\sqrt{c} \\ \hline & 4a\sqrt{b} + 2d\sqrt{c} \end{array} \qquad \begin{array}{ll} (2.) & m\sqrt{bc} \\ & n\sqrt{de} \\ \hline & m\sqrt{bc} + n\sqrt{de}; \end{array}$$

and to subtract,

$$\begin{array}{ll} (1.) & 4a\sqrt{b} \\ & 2d\sqrt{c} \\ \hline & 4a\sqrt{b} - 2d\sqrt{c} \end{array} \qquad \begin{array}{ll} (2.) & b - d\sqrt{a^3 + c} \\ & e - f\sqrt{b^3 + d^2} \\ \hline & b - d\sqrt{a^3 + c} - e + f\sqrt{b^3 + d} \end{array}$$

or reduce their exponents to others of the same value and having the same denominators.

Surds of the same rational quantity are multiplied and divided by the addition and subtraction of their exponents; if of different rational quantities, these must first be brought to others of the same denomination, and then subjected to the operation, the product or quotient being to be set under the common radical sign, and any rational coefficients prefixed. (1.) Thus, $\sqrt{a}$ and $\sqrt[3]{b^2}$, or, which is the same, $a^{\frac{1}{2}}$ and $b^{\frac{2}{3}}$, may be brought to $\sqrt[6]{a^3}$, and $\sqrt[6]{b^4}$, for $a^{\frac{1}{2}} = a^{\frac{3}{6}}$ and $b^{\frac{2}{3}} = b^{\frac{4}{6}}$. (2.) $\sqrt[m]{a} \times \sqrt[n]{b} = a$

Algebraic Arithmetic.

$^{\frac{1}{m}}b^{\frac{1}{n}}c = \sqrt[mn]{a^n b^m}$. (3.) $\frac{\sqrt[4]{a^3b^2}}{\sqrt[3]{a^2b}} = \frac{a^{\frac{3}{4}}b^{\frac{2}{4}}}{a^{\frac{2}{3}}b^{\frac{1}{3}}} = a^{\frac{3}{4}-\frac{2}{3}}$ $b^{\frac{1}{2}-\frac{1}{3}} = a^{\frac{1}{12}}b^{\frac{1}{6}} = a^{\frac{1}{12}}b^{\frac{2}{12}} = \sqrt[12]{ab^2}$.

Lastly, the involution and evolution of surds are performed, as in other quantities, by multiplying and dividing their exponents by the indices of the powers or roots required. When not joined to radical quantities, they are evidently involved to the height of the index, by simply taking away their radical signs, for any root being involved into itself produces a square, &c.; but if rational quantities are conjoined, these must be involved to the height indicated by the surd, and then multiplied into the surd quantities after the removal of the radical sign.

Though a fraction, as has been shewn, cannot always be reduced to lower terms, in which case unit is the only common divisor, yet we may, from the analytical process by which this discovery is made, derive a series of quotients which will gradually approximate to its true value; and this leads us to notice what are called *continued fractions*, with the nature of which it is of some consequence to be acquainted. Let us have to decompose the fraction $\frac{31415926535}{10000000000}$, which, as the denominator is less than the numerator, may be represented thus, $3 + \frac{1415926535}{10000000000}$. Dividing the numerator and denominator of the fractional part of this mixed number by the numerator, we have for the expression of that fractional part, $\frac{1}{7 + \frac{885142353}{1415926535}}$; proceeding in the same way with the fractional part of which, we get $\frac{1}{15 + \frac{88127110}{885142353}}$, the fractional part of which, again, becomes, in like manner, $\frac{1}{1 + \frac{301545}{88212710}}$; from which, on the same principle, we obtain $\frac{1}{292 + \frac{161570}{301545}}$, which, with its proceeds, may be operated on to any extent desired. Hence, then, we convert the original fraction into

$$3 + \frac{1}{7} + \frac{1}{15} + \frac{1}{1} + \frac{1}{292} + \frac{1}{1}, \text{ \&c. \&c.}$$

by which, it is evident, we approach nearer and nearer to the full value of the fraction. By the same process, which is precisely similar to that for finding a common divisor, we may reduce the fraction $\frac{108}{149}$, by assuming 27 as the common divisor of its numerator or denominator, into

$$\frac{4}{5} + \frac{2}{3} + \frac{6}{7}$$

and we may express any algebraic fraction in the same form, as

$$\frac{1}{a} + \frac{1}{b} + \frac{1}{c} + \frac{1}{d}, \text{ \&c.}$$

In order to restore fractions of this kind, we commence at the extreme term, and ascend by successive combinations to the first fractional portion. Thus, $\frac{2}{3} + \frac{6}{7}$, or $\frac{2}{3\frac{6}{7}}$, being, as above, multiplied by 7, gives $\frac{14}{27}$, and $\frac{4}{5\frac{14}{27}}$ multiplied by 27, gives $\frac{108}{149}$, the original fraction; and $c + \frac{1}{d} = \frac{dc + 1}{d}$, the *reciprocal* of which, that is to say, another fraction, whose numerator is its denominator, and *vice versa*, namely, $\frac{d}{cd + 1}$, being added to b, gives $b + \frac{d}{cd + 1} = \frac{bcd + b + d}{cd + 1}$, the reciprocal of which, namely, $\frac{cd + 1}{bcd + b + d}$, added to a, gives $\frac{abcd + ab + ad + cd + 1}{bcd + b + d}$

$$= a + \frac{1}{b} + \frac{1}{c} + \frac{1}{d}, \text{ \&c.}$$

Of Proportion.

Of Proportion.—We have seen that any two quantities, considered as represented by numbers, may be compared together, and that the relations which they are discovered to bear to one another are of two kinds, namely, 1. that of the difference between two or more of them, which expresses the excess of one above another; and, 2. their quotients, by which it is declared how often one of them is contained in another. To the former is applied the title of *arithmetical proportion*, and to the latter that of *geometrical proportion*; on each of which it is necessary to make some remarks. There is an example of arithmetical proportion in the progression, by a unit of difference, of the digits from one to infinitude,—1, 2, 3, 4, 5, &c.; we have another in the progression, by a common difference of *two*, among the odd numbers, commencing at *one*, thus, 1, 3, 5, 7, &c. or, generally, among any quantities represented thus, $a + b$, $a + 2b$, $a + 3b$, $a + 4b$, &c. which forms a series in arithmetical proportion, increasing by the common difference b; and in the case of a, $a - b$, $a - 2b$, $a - 3b$, $a - 4b$, &c. we have a similar series, only that it is in the order of decrease. The most material circumstances regarding such proportions are the following.

In four quantities arithmetically proportional, the sum of the extreme terms, that is, the first and the fourth, is equal to the sum of the means, that is, the two intermediate, or the second and third terms. Thus, in the case of $3 : 5 : 7 : 9$, we have $3 + 9 = 5 + 7$, as will be found on trial, and so in every other case. Or, generally, suppose $a : b : e : f$, we have $a + f = b + e$. For let d be the common difference, and then the proportion might be represented thus, $a : a + d : e : e + d$. Accordingly, the sum of the extremes, namely, $a + e + d$ contains the identical quantities found in the sum of the means, namely, $a + d + e$. Having, therefore, three of the four quantities of an arithmetical proportion, we can easily find the fourth, by adding the second and third together, and subtracting the first from the sum, in the remainder of which we have the quantity sought. On the same principle, it is demonstrable, that if any three numbers be in arithmetical proportion, the sum of the first and last will be equal to the double of the mean number; or if $a : b : e$, then $a + e = 2b$. For d being the difference, we may say, $a : a + d : a + 2d$; then $a + a + 2d = 2a + 2d = a + d \times 2$. In a series of arithmetical proportionals, however numerous, the

Of Proportion.

sum of the first and last term is equal to the sum of any two terms which are equally distant from the extremes. As, let the first terms be a, $a + d$, $a + 2d$, &c. and the last term x; then the last term but one will be $x - d$, the last but two $x - 2d$, &c. Putting, therefore, the last half of the terms under the corresponding numbers of the first half, we have,

$$a,\ a + b,\ a + 2b,\ a + 3b,\ \&c.$$
$$x,\ x - b,\ x - 2b,\ x - 3b,\ \&c.$$

where it will be seen that the sum of every relative pair is equal to that of the first and the last term, viz. $a + x$. It follows from this, that the sum of an arithmetical progression is equal to that of the first and the last taken half as often as the number of the terms; that is, using algebraical symbols, and taking n for the number of the terms, the sum of the whole will be $\overline{a + x} \times \frac{n}{2}$. The first term alone hath no difference added to it; and it is clear, that the last term has the difference added to it as many times as it is distant from the first; whence the difference between the first and the last term is the product of the common difference multiplied by the number of the terms *minus* unity; that is $x - a = \overline{n - 1} + d$, and hence $x = a + \overline{n - 1} + d$. If the series have nothing (0) for its first term, then its sum will be equal to half the product of the last term multiplied by the number of the terms; for the sum which in general is $\overline{a + x} \times \frac{n}{2}$, will in this case, as $a = o$, be $x \times \frac{n}{2}$, that is $\frac{nx}{2}$. On the whole, if of the five constituent parts of an arithmetical proportion, namely, a the first term, x the last term, d the common difference, n the number of the terms, and s the sum of all the terms, any three be given, the other two may be easily found. The following formulae exhibit some of the processes by which they are discovered:

(1) Given a, x, n, to find s and d.

$$\frac{an + xn}{2} = s; \text{ and } \frac{x - a}{n - 1} = d.$$

(2) To find x, having a, d, and n:

$$a + d\,(n - 1) =$$

(3) Having x, d, n, to find a.

$$x - dn + d = a.$$

(4) Knowing a, x, d, to discover n.

$$\frac{x - a + d}{d} = n.$$

(5) From a, n, s, to determine x.

$$\frac{2s - an}{n} = x.$$

(6) With x, n, s, to find a.

$$\frac{2s - nx}{n} = a.$$

(7) To find n from x, a, s.

$$\frac{2s}{a + x} = n.$$

Of Proportion.

When proportion is spoken of without specification, *geometrical proportion* is generally understood. We have an example of it in the series 2, 6, 4, 12. in which, as expressed in the usual way, 2 : 6 : 4 : 12. The second and the fourth terms, called the *consequents*, are equal multiples, namely, by 3, of the first and third respectively, called the *antecedents*: and in this example, again, $a : am : b : bm$, the second and fourth are equal multiples by the number represented by m, of the first and third. We read these examples thus: 2 is to 6, as 4 is to 12; and a is to am, as b is to bm. In both, the quotient of the first and second terms is equal to that of the third and fourth terms, or $\frac{2}{6} = \frac{4}{12}$, $\frac{a}{am} = \frac{b}{bm}$. The series of geometrical proportionals may be of different kinds, as $a : b : c : d$; or $a : b^2 : c : d^2$; or $1 . a . a^2 . a^3 . a^4 . a^5$ &c.; or $a \,.\, b \,.\, \frac{b^2}{2} \frac{b}{\cdot a^2} \cdot \frac{b^4}{a3}$ &c.; or $a : ab : ab^2 : ab^3$, &c.; or $a : \frac{a}{b} : \frac{a}{b^2} \cdot \frac{a}{b^3}$, &c. Three quantities may be in geometrical proportion, as $: a : b : c$, that is, a is to b as b is to c, in which the two middle terms are conceived to be equal.

In geometrical proportionals, the product of the extreme terms is equal to the product of the middle terms. For let $a : am : b : bm$. Now, $\frac{a}{am} = \frac{b}{bm}$, wherefore, $abm = bam$: and it is evident, that, in the case of three quantities geometrically proportional, the product of the extremes is equal to the square of the middle term. Conversely, when of four quantities the product of the extremes is equal to that of the means, or when of three quantities the product of the extremes is equal to the square of the middle term, the quantities are in geometrical proportion. Having any three quantities in geometrical proportion given, we can find a fourth proportional by multiplying the second by the third, and dividing the product by the first; for in this manner a quotient is found which, multiplied by the first term, gives a product equal to that of the second and third terms. For example, suppose $a : am : b : x$, x representing the unknown quantity: then, $a \times x = am \times b$; whence $x = \frac{amb}{a} = mb$; or, suppose $a : b ; c : x$; then $ax = bc$, and dividing both quantities by a, we have $x = \frac{bc}{a}$. This constitutes what in common arithmetic is called the *Rule of Three*, and is a demonstration of its truth. The rule holds equally good for the discovery of a third term in the case of three geometrical proportions; for, let $a : b : x$ then $ax = b^2$, and $x = \frac{b^2}{a}$.

It is obviously necessary, in the practice of the rule, to have the terms arranged in a certain manner; and for this purpose let the following direction be attended to. First, set down the quantity that is of the same kind with the quantity sought, and then discover, from the nature of the question, whether that given quantity is greater or less than the sought for quantity; if greater, place the greater of the other two quantities on the left hand, and the less on the right; but if less, place the greater on the right hand and the other on the left.

When four quantities, as $a : b :: c : d$, are geometrical proportionals, they will remain so, if taken in any of these ways, viz. *alternately*, $a : c :: b : d$; *inversely*, $b : a :: d : c$, $d : b : c : a$, $c : a : d : b$; by *composition* or *multiplication*, $a + b : b :: c + d : d$, $a + b : a : c + d : c$; by *division* or *subtraction*, $a - b : b :: c - d : d$, $a - b : a : c - d : c$; by stating either the sum of the antecedents to that of the consequents as the antecedent to the consequent, that is, $a + c : b + d : a : b$ (or $c : d$), or the difference of the antecedents to that of the consequents as antecedent to consequent, that is, $a - b : b - d : a : b$ (or $c : d$); for in all these cases it can be shewn that the product of the extremes is equal to the product of the means. In what is called *geometrical proportion continued*, that is, where a series of quantities increases or decreases by one common quantity or *ratio*, the product of the first and last terms is always equal to that of the second and last but one, or that of any two terms equally distant from the extremes. For suppose $a : ab : ab^2 : ab^3$, &c. as far as x, considered as the last term, the second last term will be $\frac{x}{b}$, the third last term $\frac{x}{b^2}$ &c. b being the common divisor; and it is evident that $a \times x = ab \times \frac{x}{b} = ab^2 \times \frac{x}{b^2}$, &c.

In a series of geometrical proportionals, all the terms except the last being antecedents, and all the terms except the first consequents, we have this proportion,—as any one of the antecedents is to its consequent, so is the sum of all the antecedents to that of all the consequents, that is, in the case of $a : ab : ab^2 : ab^3$, and $a : ab : a + ab + ab^2 + ab^3 : a + ab + ab^2 + ab^3 + ab^4$; for here, too, it may be proved, the product of the extremes is equal to that of the means. On the same principle, it may be shewn, that in such a series, the first is to the second as the sum of all the terms, *minus* the last, is to the sum of all the terms *minus* the first, or that, in $a : b : c : d : e : f : g$, and, taking s for the sum, we have $a : b : s - g : s - a$.

From these and similar premises, and representing generally the first term of a series of quantities in geometrical proportion by a, the last term by x, the common ratio by $\frac{1}{r}$, the number of all the terms by n, and the sum of all the terms by s, whence we have $s - x =$ the sum of all the antecedents, $s - a =$ the sum of all the consequents, $x = ar^{n-1}$, and $s = \frac{a - xr}{1 - r}$, we obtain sundry propositions of great use in practice; as how, knowing a, x, and n, to find $\frac{1}{r}$ and s; for, seeing $x = ar^{n-1}$, and dividing both quantities by a, we have $\frac{x}{a} = r^{n-1}$, whence extracting the root $n - 1$ from both, we get $\sqrt[n-1]{\frac{x}{a}} = r$, consequently can find $\frac{1}{r}$; and again, the value of r being substituted for it in the case of $s = \frac{a - xr}{1 - r}$, it is obvious that we find the value of s in known quantities: having a, $\frac{1}{r}$, n, we may find x and s, the former immediately, as has been shewn, for $x = ar^{n-1}$, and the latter by substituting this value of x for x in the proposition already delivered, namely, $s = \frac{a - xr}{1 - r} = \frac{a - ar^n}{1 - r}$: Knowing a, $\frac{1}{r}$, n, to discover a and s, we have $a = \frac{x}{r^{n-1}}$, and substituting this for a, we get $s = \frac{x - xr^n}{(1 - r)r^{n-1}}$: and from n, $\frac{1}{r}$, s, to determine a and x, namely $x = \frac{a + rs - s}{r}$, and then substituting this for x, we have $a = \frac{s - rs}{1 - r}$.

A few additional remarks, of a general nature, on ratio and proportion, may enable the reader satisfactorily to understand a subject on which a great deal of what is both curious and important in mathematical science depends.

Two quantities are *commensurable* when a third quantity measures them both, and *incommensurable* when no other quantity is their common measure. All whole numbers, simply taken as such, are commensurable, because unity or one can measure them: so are all fractions and mixed numbers taken in the abstract, for they can all be reduced to equivalent fractions having a common denomination, and so admit of unity for a common measure. To constitute quantities, therefore, incommensurable, they must be of different kinds, and incapable of representation and comparison by the same, or by any numbers at the same time. Thus, then, *ratio*, or the relation which one quantity bears to another in respect of magnitude, can hold only where the quantities are of the same kind; and we therefore cannot mathematically compare a number of yards with a number of pounds, the age of a man with the force of a stream, nor the velocity of a cannon ball with the contents of a vessel. The commensurability of quantities, therefore, depends on their *homogeneity*, and their incommensurability on their *heterogeneity*; and we cannot speak of the existence of any ratio between quantities except when one of them can be so multiplied as to exceed the other in magnitude. Ratio, then, denotes the absolute relation of one magnitude to another, and that whether it be assignable or not; this latter fact depending not on the nature of the magnitude, which is conceived the same in both, but on the information given or acquired respecting them. A ratio consists of two terms expressive of the quantities compared, and a character used to denote their comparison. Thus, $a : b$ denotes the ratio of the quantity a to the quantity b; the former being styled the antecedent, and the latter the consequent. When the antecedent is greater than the consequent, the

Of Proportion.

ratio is said to be of *greater inequality*; when it is less, the ratio is *one of less inequality*; and when the antecedent and the consequent are the same, the ratio is said to be *a ratio of equality*. Confining ourselves to geometrical ratio, by which is signified how often one quantity is contained in another, the value of the ratio may be represented fractionwise, the numerator being the antecedent, and the denominator the consequent; and hence, quantities or ratios may be subjected to all the rules of fractions. As ratio implies the existence of two quantities, *proportion* implies at least four, though only three may be expressed, and signifies the *equality of ratios*, or that two of the quantities have the same ratio which exists between other two. But ratio, as has been said, can be expressed fractionwise; so also can proportion or the equality of ratios. As, therefore, the magnitude of the ratio $a : b$ is measured by the fraction $\frac{a}{b}$, and that of $c : d$ by $\frac{c}{d}$, we have, in proportion or equality of ratio, $a : b : c : d$, $\frac{a}{b}=\frac{c}{d}$ the quotient of the first divided by the second = equal to the quotient of the third divided by the fourth, and reducing them to the same denomination, $\frac{ad}{bd}=\frac{bc}{bd}$, whence, taking away the common denominator, $ad = bc$, the product of the extremes equal to the product of the means. The terms of a ratio may be multiplied or divided by the same quantity without altering the value of the ratio; for $a : b$ represented as a fraction, is $\frac{a}{b}$, the numerator and denominator of which, it has been shewn, may be multiplied or divided by the same quantity, without change of value. Hence, ratios may be compared together, by reducing the fractions which represent their values to the same denominator; and a ratio may be reduced to its lowest terms, by dividing its representative fraction by its greatest common measure. Equal quantities have the same ratio to the same quantity, and two ratios being equal to a third are equal to one another; quantities have the same ratio to one another which their multiples by the same quantity have; and equimultiples of quantities have the same ratios to one another as the quantities themselves. A ratio of equality is equal to nothing. A ratio of greater inequality is diminished by adding the same quantity to both its terms, and increased by subtracting the same quantity from both; and on the contrary, a ratio of less inequality is increased by adding the same quantity to both its terms, and diminished by subtracting the same quantity from them. This last proposition can be easily proved algebraically, and shown to be true in arithmetical numbers; but will probably be at once understood from reflecting on the nature of fractions by which ratios can be represented.

Quantities which have the same ratio are called proportionals; and the terms of two ratios are said to form an *analogy*, which is expressed by saying the first is to the second as the third is to the fourth. The antecedents in an analogy, as follows from the nature of ratio, must be of the same kind, and are, therefore, said to be *homologous* to one another; and so also must be the two consequents. Hence the directions for the *rule of three*, or finding a fourth proportional. If the first of four proportional quantities be greater than the second, the third must also be greater than the fourth; if equal, *equal*; and if less, *less*. The same is true as to any equimultiples of four proportionals, and any equal divisions or submultiples of four proportionals. Of other qualities or affections of proportionals deducible from these principles, it is not now necessary to treat.

Logarithms.

LOGARITHMS are artificial numbers, used to facilitate or abridge arithmetical calculations, and may be considered as expressing the relation between an arithmetical and a geometrical series of terms, or between ratios and the measures of ratios, and are, in short, the indices or exponents of a series of numbers in geometrical progression. The origin and nature of them may be easily explained.

In an arithmetical series the quantities increase or decrease by the same difference, but in a geometrical series they increase or decrease by a common measure. The first of the following lines exhibits an arithmetical progression, all the other lines are examples of geometrical progression:

1	0, 1, 2, 3, 4, 5, 6, 7, 8, 9.
2	1, 2, 4, 8, 16, 32, 64, 128, 256, 512.
3	1, 3, 9, 27, 81, 243, 729, 2187, 6561, 25683.
4	1, 10, 100, 1000, 10000. &c. &c.

Here, considering the upper line as the index to all the rest, every term of it is the *logarithm* of a corresponding term in each of them; and it is evident, that an infinitude of other lines, or any one of the same lines, varying the point of commencement, and containing numbers in geometrical progression, might be added, to all of which the same arithmetical series might furnish logarithms. But any other series of numbers in arithmetical progression, for example, one increasing or diminishing by the common difference of two, three, four, &c. might be used for an index to a geometrical series. Hence, then, there may be various systems of logarithms, any one of which may be contrived so as to abridge calculation. It has been found most convenient to adopt that system which takes the natural series of numbers for the indices of the terms in the geometric series, 10, 100, 1000, &c. increasing in a tenfold progression, as in the fourth line.

Now, in every multiplication by a whole number, the ratio which the product bears to the multiplicand is the same as that of the multiplier to unity; and, consequently, the ratio of the product to unity must be equal to the sum of the ratios of the multiplier to unity, and the multiplicand to unity. Obviously, then, the addition of the ratios of the multiplicand to unity, and the multiplier to unity, corresponds with the multiplication of the two quantities; and, hence, adding together the representatives of such ratios, we obtain the representatives or indices of the ratios of the products to unity; and, accordingly, if we have a table containing the natural numbers with which such representatives correspond, we shall there find the product of the multiplicand and multiplier, the ratio of which was indicated. In other words, the addition of the terms of the arithmetical series corresponds to the multiplication of the terms of the geometrical series; and thus, the arithmeticals may be considered as presenting a set of artificial numbers, which, when arranged in tables, will convert operose multiplication into simple addition; and, on the same principle, the labour of division may, by means of such table, be performed by subtraction.

But we may also consider logarithms as the indices of those powers of numbers which are equal to any given numbers. This is easily explained. All affirmative numbers may be regarded as the powers of any one given affirmative number. For example, the powers of 2 may become equal, or approach within less than any assignable difference to all other numbers whatever. Now, in those numbers which are expressed by integers, as 2^0, 2^1, 2^2, 2^3, &c. we have the geometrical progression 1, 2, 4, 8, 16, &c., and the intermediate numbers of this series, viz. 3, 5, 6, 7, &c. are expressed, very nearly, by powers of 2 with fractional exponents. Thus, $3 = 2^{1.53496}$ nearly : $5 = 2^{2.3219}$: $6 = 2^{2.58496}$. The powers of 10 might be used, in the same manner, to express all numbers, as $10^0 = 1$, $10^{.30103} = 2$, $10^{.47712} = 3$; and thus also might fractions be expressed, as $10^{-1} = \frac{1}{10}$, $10^{-.30103} = \frac{1}{2}$, &c. where the negative powers of 10 are employed. In short, any number whatever, whether integer or fractional, might be taken in place of 2 or 10, and such exponents of it found as would give its powers equal to all numbers from 0 upwards; and there are, accordingly, no limits or conditions as to the magnitude of the number, the powers of which are to represent all numbers, save that it must be neither equal to unity nor negative, and that for very obvious reasons—for, in the first case, that is, if it be 1, all its powers would be $= 1$, and, in the second, that is, if negative, there will be numbers to which none of its powers can possibly be equal. Now, suppose $N = r^n$, r representing any number whatever, according to the system of logarithms adopted, then the logarithm of N is n, which may be either positive or negative. When N is 1, then $n = o$, whatever may be the value of r; and accordingly the logarithm of 1 is 0 in every system of logarithms. In the commonly adopted system, $r = 10$, so that the logarithm of any number is the index of that power of 10 which is equal to the said number. Accordingly, 100 or 10^2, that is the second power of 10 has 2 for its logarithms and 1000, that is 10^3, or the third power of 10, has 3 for its logarithm: or, as in this series,

	10^3,	10^2,	10^1,	10°,	10^{-1},	10^{-2},	10^3,
that is, -	1000,	100,	10,	1,	.1,	.01,	.001,
we have respectively for the logarithms	3,	2,	1,	0,	— 1,	— 2	— 3

Now the logarithm of any number that is intermediate between any two terms in the first series, is included between the corresponding terms of the last series, and consequently will have the same index, whether positive or negative, as the less of the terms, together with a decimal fraction, which is always positive. For instance, 50 falls between 10 and 100; its logarithm therefore falls between 2 and 1, and has 1 for its index, or characteristic, as it is sometimes called, and a decimal fraction, that is together 1.69897. Thus, then, 0, 1, 2, 3, 4, &c. are the logarithms of 1, 10, 100, 1000, 10000, &c. in a system of logarithms having 10 for its *base*, that is, the number the powers of which, as marked by exponents, are used to indicate the logarithms of other numbers. The index, or characteristic of a logarithm, is always either $= 0$, or an integer, positive or negative, and points out the place that is occupied by the first significant figure of the given number, either above or below that of units, being positive in the former case, and negative in the latter. When negative, the sign — is usually set over the characteristic to distinguish it from the decimal part, which, as already mentioned, is always positive. But the whole expression may be converted into a negative form by making the characteristic figure less by 1, and taking the arithmetical complement of the decimal, namely, commencing at the left hand, and subtracting each figure from 9, except the last significant figure, which is to be subtracted from 10, the remainder constituting the required logarithm in an entirely negative form. Thus, the logarithm .05, that is, $\overline{2}.69897$, or $— 2 + .69897$, may also be expressed by $— 1.30103$, which is entirely negative. On the other hand, such logarithms are sometimes conveniently expressed altogether in a positive form, by joining to the tabular decimal the complement of the index to 10, as in the above case, 8.69897.

A system of logarithms, then, may be considered as the numbers arising in and expressed by the indices or exponents of a power according to every value that may be given to that power, while the base of the system, which is the same as the base of the power, may be any constant number greater than unity. The number 10, as already remarked, is the number chosen for the base in the system of logarithms now generally adopted, which is that of Henry Briggs; whereas the radical number in the system originally proposed by the celebrated Napier, the inventor of logarithms, is 2.7182818, &c. But however systems of logarithms may differ in this respect, the logarithms of the same number are always in a constant ratio to one another. Thus, if in one, $a^m = b$, and in another $e^n = b$, then, whatever b may be, m will be to n in the same ratio: for $a^m = b = e^n$, and therefore $a^{\frac{m}{n}} = e$; so that the fraction $\frac{m}{n}$ depends on a and e, and is the same whatever be the value of b. It follows, that the logarithms of any one system being computed, those of any other may be easily determined. Of the methods of constructing logarithms we need not speak particularly, as we merely concern ourselves with the general principles of numbers. The following table, which gives the logarithms of numbers from 1 to 110, will afford some idea of the nature of them, and serve all the purposes we have at present in view.

Num.	Logar.	Num.	Logar.	Num.	Logar.
1	0,0000000	41	1,6127839	81	1,9084850
2	0,3010300	42	1,6232493	82	1,9138139
3	0,4771213	43	1,6334685	83	1,9190781
4	0,6020600	44	1,6434527	84	1,9242793
5	0,6989700	45	1,6532125	85	1,9294189
6	0,7781513	46	1,6627578	86	1,9344985
7	0,8450980	47	1,6720979	87	1,9395193
8	0,9030900	48	1,6812412	88	1,9444827
9	0,9542425	49	1,6901961	89	1,9493900
10	1,0000000	50	1,6989700	90	1,9542425
11	1,0413927	51	1,7075702	91	1,9590414
12	1,0791812	52	1,7160033	92	1,9637878
13	1,1139434	53	1,7242759	93	1,9684829
14	1,1461280	54	1,7323938	94	1,9731279
15	1,1760913	55	1,7403627	95	1,9777236
16	1,2041200	56	1,7481880	96	1,9822712
17	1,2304489	57	1,7558749	97	1,9867717
18	1,2552725	58	1,7634280	98	1,9912261
19	1,2787536	59	1,7708520	99	1,9956352
20	1,3010300	60	1,7781513	100	2,0000000
21	1,3222193	61	1,7853298	101	2,0043214
22	1,3424227	62	1,7923917	102	2,0086002
23	1,3617278	63	1,7993405	103	2,0128372
24	1,3802112	64	1,8061800	104	2,0170333
25	1,3979400	65	1,8129134	105	2,0211893
26	1,4149733	66	1,8195439	106	2,0253059
27	1,4313638	67	1,8260748	107	2,0293838
28	1,4471580	68	1,8325089	108	2,0334238
29	1,4623980	69	1,8388491	109	2,0374265
30	1,4771213	70	1,8450980	110	2,0413927
31	1,4913617	71	1,8512583	111	2,0453230
32	1,5051500	72	1,8573325	112	2,0492180
33	1,5185139	73	1,8633229	113	2,0530784
34	1,5314789	74	1,8692317	114	2,0569049
35	1,5440680	75	1,8750613	115	2,0606978
36	1,5563025	76	1,8808136	116	2,0644580
37	1,5682017	77	1,8864907	117	2,0681859
38	1,5797836	78	1,8920946	118	2,0718820
39	1,5910646	79	1,8976271	119	2,0755470
40	1,6020600	80	1,9030900	120	2,0791812

Among the many logarithmical tables which have been published, those of Hutton, Callet, and Borda, may be specified as particularly meriting the praise of accuracy and extensiveness. The following remarks will give some information respecting the nature of such works. The large table in Dr Hutton's work contains the logarithms to all numbers from 1 to 100,000, by which we may find the logarithm to any number, and the number to any logarithm, to 7 places of figures. It consists of two parts, the first comprehending, in four pages, the first 1000 numbers with their corresponding logarithms in adjacent columns; and the second containing all the 100,000 numbers and their logarithms, with the differences and proportional parts thus arranged. In the first column of each page are the first four figures of the numbers, and along the top and bottom of the columns is the fifth figure, in which columns all the logarithms are placed, the first three figures of each logarithm being at the beginning of the lines in the first column of logarithms, signed 0 at the top and bottom, and the other four figures in the remaining columns. The column of differences stands after the columns of logarithms, and then the column of proportional parts, which shows what proportional part of each difference corresponds to 1, 2, 3, &c. or the $\frac{1}{10}$, $\frac{2}{10}$, $\frac{3}{10}$, &c. of the differences, the whole difference answering to 10. The logarithms in the columns are all supposed to be decimals, and their corresponding natural numbers may be either integers, decimals, or mixed numbers; for the same figures, whichever they are, have the same decimal logarithms, and these differ only in the index, as already mentioned. If the natural number consist of only one place of integers, the index of the logarithm is 0; if it consist of two places, it is 1; if of 3, 4, 5, &c. the indices of the logarithms are respectively 2, 3, 4, &c. being always one less than the number of integer places. The same figures made negative give the index of the logarithm of a decimal. Thus the natural numbers being decimals, and their first significant figures in the places of 1st, 2d, 3d, 4th, &c. the indices of their logarithms will be respectively 0, 1, 2, 3, &c. written with negative signs, only these are placed above the indices instead of before them, it being intended thereby to signify that the indices are the only part of the logarithms considered as negative, the decimal parts being always positive. In arithmetical addition and subtraction with logarithms, the negative indices have the contrary effect to that of the decimal part of the logarithm; for example, when the logarithm is to be added, the index must be subtracted, and *vice versa.*

The chief properties of logarithms are these. 1. The sum of the logarithms of two numbers is equal to the logarithm of their product: For, let the numbers be c and d, and their logarithms p and r, so that $a^p = c$, a representing the base of a system of logarithms, and $a^r = d$: then we have $a^p \times a^r = cd$, or $a^{p+r} = cd$; that is, $p + r$, the sum of the logarithms of the two numbers c and d, is the logarithm of their product cd. But c and d may be any numbers; wherefore, &c. 2. The difference of the logarithms of two numbers is equal to the logarithm of their quotient: For, representing the numbers and their logarithms as before, and $a^p = c$, and $a^r = d$; then $\frac{a^p}{a} = \frac{c}{d}$, or $a^{p-r} = \frac{c}{d}$, that is, $p - r$, the difference of the logarithms of c and d, is the logarithm of $\frac{c}{d}$; and c and d may be any numbers; wherefore, &c. 2. The logarithm of the power of any number is equal to the logarithm of the number taken as often as is denoted by that power; *e. g.* the log. $b^n = n$ log. b. For b^n is b multiplied into itself as often as is signified by n; and, therefore, the log. of b^n is equal to the log. of b taken as often as n times, *i. e.* to n log. b. On the same principle it can be shewn, that the logarithm of any root of a number is equal to the logarithm of that number divided by the index of the roots.

EQUATIONS.—The term equation is used to signify a proposition in which the equality of two quantities is asserted and expressed; and this is done, as already frequently shewn, by placing the sign = between them. When a quantity stands alone on one side of an equation, its value is had in the terms of the quantities which are on the other side; and that value is known if these quantities are known; in which case the equation is said to be *resolved*. The two parts of an equation are called its members; each member may consist of several terms, some of which may be known and others unknown; and the value of an unknown quantity is called the *root* of an equation. Known quantities are generally represented by the first letters of the alphabet, a, b, c, d, &c.; unknown quantities by the last letters, u, x, y, z; but these representations are of course quite arbitrary. The principal object of an equation is to *disengage* any unknown quantities; that is, to bring them alone to one side of the sign, so that their value may be obtained in the known quantities which are on the other side. Such disengagement, then, is the conclusion at which we wish to arrive in working at any question or problem given to be resolved. Equations are of various degrees or orders, and have specific names, according to the highest power of the unknown quantities found in them. Thus, they are *simple*, if they contain only the first or simple power of an unknown quantity, that is, where the unknown quantity is only of one dimension; *quadratic*, if they contain the square; *cubic*, if the third power; and so on. An equation, in reality, is merely a short method of stating the relation that subsists between different quantities, known and unknown, so that the latter may be discovered by means of the former, and is always capable, if it have any meaning, of being expressed in common language. The most useful application of algebra being the investigation of such relations among quantities as are thus expressed, from which circumstance it has obtained the title of analysis, or the analytical art, the doctrine of equations is one of its chief departments, and demands corresponding attention. It comprehends several processes, the foundation of which is laid in these axioms: 1. If equal quantities be added to equal quantities, their sums will be equal; 2. If equal quantities be taken from equal quantities, their remainders will be equal; 3. If equal quantities be multiplied by equal quantities, their products will be equal; and, 4. If equal quantities be divided by equal quantities, their quotients will be equal. Proceeding on these self-evident principles, then, we may apply the rules of addition, subtraction, multiplication, and division, to the resolution of equations, in the following manner;

First, We may transpose any quantity from one side of an equation to the other, provided we change its sign; for this is either simply to add equal quantities to equal quantities, or to subtract equal quantities from both sides; and, for the same reason, we may change the sign of all the terms of an equation without destroying the equality. If, then, we have an unknown quantity and certain known quantities mixed in an equation, we may separate the former from the latter, by bringing it alone to one side, and all the rest to the other.

Suppose $x + 20 = 50$

Then by transposition $x = 50 - 20 = 30$

Or, if $x - a = b$, then $x = a + b$

Again, $4x - 12 = 3x + 7$

Then, $4x - 3x = 12 + 7$, or $x = 19$

Secondly, Any quantity by which the unknown quantity is multiplied may be removed, if we divide by it all the other quantities on each side of the equation; and thus, therefore, any co-efficient of the unknown quantity may be taken away; for in this manner we divide equal quantities by equal quantities, and obtain equal quotients:

Suppose $5x = 35$,

Then $x = \frac{35}{5} = 7$,

Or, if $25x + 20 = 20x + 60$;

Then $25x - 20x = 5x = 60 - 20 = 40$,

And $x = \frac{40}{5} = 8$;

Again, if $ax + 2ab = 4c$,

Then $ax = 4c - 2ab$,

And $x \quad \frac{4c}{a} - 2b$.

Thirdly, Any quantity by which the unknown quantity is divided may be taken away, if we multiply all the other terms by it; and thus, therefore, if the unknown quantity be expressed fractionwise, the denominator may be removed from it by multiplying all the other terms.

Suppose $\frac{x}{6} = a + 6$,

Then $x = 6a + 36$;

Or, if $\frac{x}{4} + 6 = 20$,

Then $x + 24 = 80$,

And $x = 80 - 24 = 56$,

Again, if $\frac{6x}{3} + 26 = 4x + 8$,

Then $6x + 78 = 12x + 24$,

Hence $78 - 24 = 54 = 12x - 6x = 6x$,

And $x = \frac{54}{6} = 9$.

Fourthly, It follows, that any quantity that is found on both sides of an equation, having the same sign, may be taken away from both; and any quantity that multiplies or divides all the terms of an equation may be taken out of all.

Suppose $5x + a = a + b$,

Then $5x = b$,

And $x = \frac{b}{5}$;

Or, if $4ax + 5ab = a^2 + ac$,

Then $4x + 5b = a + c$,

So $4x = a + c - 5b$

And $x = \frac{a + c - 5b}{4}$.

Again, if $\frac{x}{4} + \frac{12}{4} = \frac{20}{4}$,
Then $x + 12 = 20$,
And $x = 20 - 12 = 8$.

Fifthly, An equation containing an unknown quantity in the form of a surd root, may be reduced to another that shall be free from such surd, by bringing the term in which it occurs to one side, taking away the radical sign from it, and raising the terms on the other side to the power denominated by the surd: and if that side of an equation that contains the unknown quantity be a complete square, cube, or other power, we may extract such root of the power from both sides, and so reduce the equation.

Suppose $\sqrt{8x + 20} = 6$,
Then $8x + 20 = 36$,
Hence $8x = 36 - 20 = 16$,
And $x = \frac{16}{8} = 2$;

Or, if $\sqrt{ax - b^2} = c + d$,
Then $ax - b^2 = \overline{c + d}^2 = c^2 + 2cd + d^2$,
Hence $ax = b^2 + c^2 + 2cd + d^2$,
And $x = \frac{b^2 + c^2 + 2cd + d^2}{a}$;

Of if $x^2 + ax + \frac{a^2}{4} = b^2$,

Then $x + \frac{a}{2} = \pm b$,

And $x = \pm b - \frac{a}{2}$;

Again, if $x^2 + 14x + 49 = 121$,
Then $x + 7 = \pm 11$,
And $x = \pm 11 - 7 = 4$ or -18.

In these two last examples, the ambiguous sign ± is used to denote that the root may be either positive or negative, which will be easily understood by recollecting what was said of the signs in multiplication, viz. that like signs whether positive or negative give positive products, so that the roots of b^2, and 121 may be either $-b$ and -11, or $+b$ and $+11$.

Sixthly, Generally speaking, when there are two or more unknown quantities in a question proposed for solution, we must have an equal number of independent equations, from which the values of the unknown quantities can be separately determined, and these values may be substituted for the unknown quantity, so as to be compared together; and thus new equations will arise, which must be treated on the principles now laid down. In practising this rule, we may employ a separate letter for each of the unknown quantities, till their values be so determined as to admit of comparison; sometimes, at the very outset, we may find it more convenient to express one or more of them in terms of another, as discoverable in the conditions of the question; and various modes of implifying and facilitating the solution will suggest themselves to one who thoroughly understands the rationale of the process, and is accustomed to perform it. A few examples will best disclose some of these modes and the nature of the operation.

1. Given the sum of two quantities and their difference, to find out the quantities.

Let their sum be s and their difference d, the greater x, and the less y. Here then we have

$$x + y = s$$
$$x - y = d$$

Consequently $\begin{cases} x = s - y \\ x = d + y. \end{cases}$

Substituting these two values of x for x, we shall have $s - y = d + y$,
Therefore $s - d = 2y$,
So $y = \frac{s - d}{2}$
And $x = \frac{s + d}{2}$.

We might come to the same conclusion by other methods. For suppose the greater number x, then the less would be $x - d$. But these two together, that is, $x + x - d = 2x - d = s$, whence the greater, or $x = \frac{s + d}{2}$, and the less, or $x - d = \frac{s - d}{2}$. Or again, let x represent the less quantity, then $x + d$ will be the greater, and $x + x + d = 2x + d = s$. Whence the less, or $x = \frac{s - d}{2}$, and the greater, or $x + d = \frac{s + d}{2}$.

Ex. 2.—Given the sum of two quantities and their proportion, to discover the quantities. Let s be the sum, the proportion be as a to b, and the quantities be represented by x and y. We have $x + y = s$, and $x = s - y$, and suppose $x : y : a : b$. Then $bx = ay$, and $x = \frac{ay}{b}$, also $= s - y$. So $\frac{ay}{b} = s - y$. Whence $s = \frac{ay}{b} + y$, $bs = ay + by = \overline{a + b} \times y$, consequently $y = \frac{bs}{a + b}$ and $x = \frac{ay}{b} = \frac{as}{a + b}$.

Ex. 3.—The sum of two numbers is the 6th part of their product, and the greater is to the less as 3 to 2. What are the numbers?

Let the numbers be x and y. Here we have

$$x + y = \frac{xy}{6}$$
$$x : y : 3 : 2$$

Whence $yx = 6x + 6y$
$yx - 6x = 6y$
$\overline{y - 6} \times x = 6y$
$x = \frac{6y}{y - 6}$ also $= \frac{3y}{2}$.

Consequently $\frac{6y}{y - 6} = \frac{3y}{2}$

Thence $12y = 3y^2 - 18y$,
So $12y + 18y = 30y = 3y^2$,

Therefore $30 = 3y$, and $y = \frac{30}{3} = 10$.

Lastly, $x = \frac{3y}{2} = \frac{30}{2} = 15$.

Ex. 4.—Given $\begin{cases} 5x - 3y = 9 \\ 2x + 5y = 16 \end{cases}$ to find x and y.

Here multiplying these two equations by such numbers as will make the terms which contain the unknown quantities the same in both, viz. the first by 2, and the second by 5, we have

$$10x - 6y = 18$$
$$10x + 25y = 80,$$

and substracting the first from the second,

$$31y = 62, \text{ whence } y = \frac{62}{31} = 2,$$

but from the first equation

$$x = \frac{9 + 3y}{5}, \text{ so } = \frac{9 + 6}{5} = \frac{15}{5} = 3.$$

This question may be otherwise solved thus; viz. multiplying the first equation by 5, and the second by 3, we have

$$25x - 15y = 45$$
$$6x + 15y = 48,$$

and adding these together, $\{ 31x = 93,$

$$\text{whence} \quad x = \frac{93}{31} = 3;$$

but from the second equation,

$$y = \frac{16 - 2x}{5} = \frac{16 - 6}{5} = \frac{10}{5} = 2.$$

Ex. 5.—Given $\begin{cases} x + y + z = 12 \\ x + 2y + 3z = 20 \\ \dfrac{x}{3} + \dfrac{y}{2} + z = 6 \end{cases}$ to find the three quantities x, y, z.

Here taking the three values of x, we have

$$x = \begin{cases} 12 - y - z \\ 20 - 2y - 3z \\ 18 - \dfrac{3y}{2} - 3z \end{cases}$$

Comparing these together, we get

$$12 - y - z = 20 - 2y - 3z = 18 - \frac{3y}{2} - 3z,$$

in which only y and z are involved.

So $2y - y + 3z - z = y + 2z = 20 - 12 = 8$,
Again, $36 - 3y - 6z = 24 - 2y - 2z$
Wherefore, $36 - 24 = 12 = 3y - 2y + 4z = y + 4z$,
Consequently $y \begin{cases} = 8 - 2z \\ = 12 - 4z; \end{cases}$

Comparing these two values, we have

$$8 - 2z = 12 - 4z,$$

Which gives $4z - 2z = 2z = 12 - 8 = 4$,

$$\text{Therefore} \begin{cases} z = \frac{4}{2} = 2. \\ y = 8 - 2z = 4 \\ x = 12 - y - z = 6 \end{cases}$$

Ex. 6.—Given $\begin{cases} x + y = a \\ x + z = b \\ y + z = c \end{cases}$ to determine x, y, z,

$$\text{Then} \quad \begin{aligned} x &= a - y, \\ a - y + z &= b \\ y + z &= c \end{aligned}$$

By addition $a \ldots + 2z = b + c$,
Whence $2z = b + c - a$,

$$\text{Consequently} \begin{cases} z = \dfrac{b + c - a}{2} \\ y = c - z = \dfrac{c + a - b}{2} \\ x = a - y = \dfrac{a + b - c}{2} \end{cases}$$

Ex. 7.—There are three numbers such, that the first with half of the other two, the second with one-third of the other two, and the third with one-fourth of the other two, are each equal to 34. Required the numbers. Let them be x, y, z. Then we have

$$x + \frac{y + z}{2} = 34, \text{ whence } x = \frac{68 - y - z}{2}$$
$$y + \frac{x + z}{3} = 34, \qquad x = 102 - 3y - z$$
$$z + \frac{x + y}{4} = 34, \qquad x = 136 - 4z - y$$

The first and second of these values give $\frac{68 - y - z}{2} = 102 - 3y - z$, which reduced is $y = \frac{136 - z}{5}$.

The second and third give $102 - 3y - z = 136 - 4z - y$, which reduced is $y = \frac{3z - 34}{2}$.

Comparing, then, these two values of y, we get $\frac{3z - 34}{2} = \frac{136 - z}{5}$, and this reduced comes to $15z - 170 = 272 - 2z$, that is,

$$17z = 442,$$

$$\text{Consequently } z = \frac{442}{17} = 26$$
$$y = \frac{136 - z}{5} = \frac{136 - 26}{5} = \frac{110}{5} = 22$$
$$x = 102 - 3y - z = 102 - 66 - 26 = 10$$

Seventhly, In the case partly alluded to, of a pure *quadratic* equation, involving only one unknown quantity, we must transpose the terms of the equation, so as to bring the square of the unknown quantity to one side, and the known quantities on the other, when dividing both sides by the co-efficient of the square, if it have one, we extract the square root from each side; but in the case of what is called an *adfected quadratic* equation, that is, where the square of the unknown quantity is found with, or affected, by its side or root, we must, after coming to the final equation by the steps already explained, have recourse to an additional method, the rationale of which will be understood from the following remarks: The square of a binomial, whether common or residual, is a trinomial; and of the terms which compose it the first is always affirmative and a pure square, viz. that of the leading quantity; so also is the third term an affirmative and pure square of the following quantity; whereas the middle term is double the product of the two quantities composing the binomial, and has either + or — for its sign, according as the members of the binomial are so connected. Whence it follows, that the third term is always the square of half the co-efficient of the leading quantity as found in the second term. For example, in the square $a^2 \pm 2ab + b^2$, where the co-efficient of the leading quantity in the second term is $2b$, the half of which, or b, gives b^2 for the third term of the trinomial. Obviously, then, if the two first of three terms in the square of a binomial be given, the third is to be found in the square of half the co-efficient of the leading quantity in the second term, which process is called completing the square; and this being done, the root of the trinomial is to be had in the binomial itself, which consists of the square root of the first term +, or —, that of the last term, according as the middle term of the trinomial is affirmative or negative. Hence, then, the rule is, after having brought the adfected equation to this condition, $x^2 \pm ax = \pm b$, &c. to add to each side the square of half the co-efficient of the unknown quantity in the second term, and then to extract the square root from each side.

Ex. 1.—Given $x^2 - 10x = 11$, to find x. Here adding 25, the square of half the co-efficient in the second term, to both sides, we have $x^2 - 10x + 25 = 11 + 25 = 36$; therefore, extracting the square root from both sides, we have $x - 5 = \sqrt{36} = 6$, consequently $x = 6 + 5 = 11$.

Ex. 2.—Divide 20 into two parts such that their product shall be 64.

Put x for one, and either y or $20 - x$ for the other. Here we have $x + y = 20$, and $xy = 64$, whence $x = 20 - y$, and, substituting this value of x, we get $20y - y^2 = 64$, whence, making the square affirmative, we have $y^2 - 20y = -64$; to both sides of which adfected equation add the square of half the co-efficient in the second term, viz. 10, and there is obtained

$$y^2 - 20y + 100 = -64 + 100 = 36,$$

from which extracting the square root, we find

$$y - 10 = \pm 6,$$

and, consequently, $y = 10 \pm 6 = 16$ or 4,

and $x = 20 - y = 4$ or 16,

in which we obtain two values of the unknown quantities, one of which, however, necessarily determines the other. In reality, it can be shewn, on a principle before explained, that every quadratic equation contains two values of the unknown quantity, and that it is from the nature of the question alone that we can determine which of them is to be taken.

Ex. 3.—The difference of two numbers is 15, and half their product is equal to the cube of the less; required the numbers. Let the less be x; then

$$x + 15 = \text{the greater},$$

and we have $\dfrac{x^2 + 15x}{2} = x^3$,

whence $x^2 + 15x = 2x^3$,

and $x + 15 = 2x^2$,

consequently, $\dfrac{15}{2} = x^2 - \dfrac{x}{2}$;

completing the square, we get

$$x^2 - \frac{x}{2} + \frac{1}{16} = \frac{15}{2} + \frac{1}{16} = \frac{121}{16}.$$

Then extracting the root, we have $x - \frac{1}{4} = \pm\frac{11}{4}$, and transposing, $x = \pm\frac{11}{4} + \frac{1}{4} = 3$, or $-\frac{5}{2}$, from which the greater will be found to be 18.

Eighthly, When a quadratic equation contains two or more unknown quantities, we must either find the value of one of them in terms of the other, and then substitute this value for it; avail ourselves of their particular relations to each other, in order to obtain equivalent or corresponding expressions; or substitute for one unknown quantity the product of another with a third unknown quantity. A single example of one, namely the first of these methods, is all that need be given here.

There are two quantities such, that if the sum of twice the greater added to the less be divided by three the quotient will be 9, and three times their product will be 210. What are the quantities? Let them be x the greater and y the less. Then we have $\frac{2x + y}{3} = 9$, and $3xy = 210$. The first of these gives successively $2x + y = 27$, $2x = 27 - y$, $x = \frac{27 - y}{2}$.

Wherefore, by the conditions $3xy = 3\left(\frac{27 - y}{2}\right)y = 210$ or $81y - 37^2 = 420$; consequently, by changing the signs and dividing by 3, we get $y^2 - 27y = -140$.

Complete the square $y^2 - 27y + \frac{729}{4} = \frac{729}{4} - 140 = \frac{729 - 560}{4} = \frac{169}{4}$,

Hence $y - \frac{27}{2} = \pm\frac{13}{2}$, and so $y = \frac{27 \pm 13}{2} = \frac{40}{2}$ or $\frac{14}{2} = 20$ or 7,

And therefore $x = \frac{27 - y}{2} = \frac{27 - 20 \text{ or } 7}{2} = \frac{7 \text{ or } 20}{2} = 3\frac{1}{2}$ or 10.

Equations of the higher orders may all be considered as arising from the multiplication of those of inferior dimension; for equations, like quantities, can be involved. They are, therefore, powers of inferior quantities; thus, a cubic equation is generated by the multiplication of three simple equations, or of one quadratic equation and one simple equation: a biquadratic arises from the multiplication of four simple equations, two quadratics, or a cubic and a simple equation, &c. Our object in the solution of such equations is the discovery of their roots, by a process analogous to that of evolution. When the simple equations from which others of higher orders arise by multiplication are different, the dimensions of these are equal to the sums of the dimensions of the equations multiplied. The generation of such equations must be clearly understood, in order to the discovery of the proper rules for their resolution. Let the values of the unknown quantity x, in any simple equations, be a, b, c, d, &c., that is, suppose $x = a$, $x = b$, $x = c$, &c. In any of these cases, both the terms may be brought to one side, and we should have an equation which may be thus expressed, $x - a = o$, $x - b = o$, $x - c = o$, the signs + and — here denoting contrariety in general, consequently negative roots being admitted as well as affirmative, the positive terms being equal to the negative. Now, the product of any two of these equations gives a quadratic, of three of them a cubic, &c., and generally, in the equation so produced, the highest dimension of the unknown quantity is equal to the number of simple equations multiplied together, or to the sum of their dimensions; and, on the other hand, an equation of any dimension may be considered as compounded either of as many simple equations as it has dimensions, or of other equations such that the sum of their dimensions is equal to its dimensions. It follows, that any equation admits of as many solutions as there are simple equations in its composition, and that the whole difficulty which it presents consists in finding these simple equations: again, an equation can admit of no more solutions, or, in other words, can have no more roots, than the units in its dimension: farther, it is demonstrable, that the imaginary, or impossible roots of equations, must enter them by pairs; that hence an equation of an odd dimension must have at least one possible root, and that an equation of an even dimension may have all its roots impossible. Moreover, as the square of any quantity is always positive, and consequently the square root of a negative is impossible or imaginary, it seems that a quadratic may have no impossible expression in its co-efficients, but, nevertheless, when resolved into simple equations, may involve impossible expressions. But a cubic equation, which cannot be produced by quadratic equations only, must have one simple equation besides, if none of its co-efficients are impossible, will have at least one real root, namely, that of the simple equation whence it arises. Moreover, the roots of the higher equations are either positive or negative, according as the roots of the simpler ones whence they are produced are positive or negative. Lastly, when one root of an equation is found, one of the simple equations is discovered from which it is compounded, and the given equation being divided thereby, will yield an equation of a dimension lower by 1; so that equations may, in this manner, be reduced as many degrees as there are roots of them, by whatever methods discovered.

The general properties of the signs and co-efficients of the terms of equations will be best understood from examining the following table, which shews the method by which those of the higher dimensions are generated by the successive multiplication of simple equations. Take, then, for examples of these simple equations, those just now stated, viz. $x - a = o$, $x - b = o$, $x - c = o$, &c. in which the roots are the positive quantities, $+a$, $+b$, $+c$, and let them be multiplied together, thus,—

$$x - a = o$$

$$+ x - b = o$$

$$= \left.\begin{array}{l} x^2 - ax \\ \qquad - bx + ab \end{array}\right\} = o, \text{ a quadratic.}$$

$$\times\ x - c = o$$

$$= x^3 \left.\begin{array}{l} -a \\ -b \\ -c \end{array}\right\} + x^2 \left.\begin{array}{l} +ab \\ +ac \\ +bc \end{array}\right\} \times x - abc = o, \text{ a cubic.}$$

$$\times\ x - d = o$$

$$= x^4 \left.\begin{array}{l} -a \\ -b \\ -c \\ -d \end{array}\right\} + x^3 \left.\begin{array}{l} +ab \\ +ac \\ +ad \\ +bc \\ +bd \\ +cd \end{array}\right\} \times x^2 \left.\begin{array}{l} -abc \\ -abd \\ -acd \\ -bcd \end{array}\right\} \times x + abcd = o, \text{ a biquadratic.}$$

$$\times\ x - e = o$$

$$= x^5 \left.\begin{array}{l} -a \\ -b \\ -c \\ -d \\ -e \end{array}\right\} \times x^4 \left.\begin{array}{l} +ab \\ +ac \\ +ad \\ +ae \\ +bc \\ +bd \\ +be \\ +cd \\ +ce \\ +de \end{array}\right\} \times x^3 \left.\begin{array}{l} -abc \\ -abd \\ -abe \\ -acd \\ -ade \\ -ace \\ -bcd \\ -bce \\ -bde \\ -cde \end{array}\right\} \times x^2 \left.\begin{array}{l} +abcd \\ +abce \\ +abde \\ +acde \\ +bcde \end{array}\right\} \times x - abcde = o, \text{ a sursolid.}$$

&c.

It appears from this table, that the co-efficient of the first term is 1; that the co-efficient of the second term is the sum of all the roots, *a*, *b*, *c*, *d*, *e*, having their signs changed; that the co-efficient of the third

term is the sum of all the products that can be made by multiplying any two of the roots together; that the co-efficient of the fourth term is the sum of all the products that can be made by multiplying together any three of the roots having their signs changed, and so on as to all the other co-efficients; and that the last term is always the product of all the roots multiplied together and having their signs changed. In this table, the simple equations, from which the higher ones are formed, have all positive roots; but the inferences deduced from it as to the co-efficients are equally true when the simple equations have negative roots. Thus, suppose $x^3 - px^2 + qx - r = o$ to represent any cubic equation, then p shall be the sum of the roots, q the sum of the products made by multiplying any two of them together, r the product of all the three; and if $-p, +q, -r, +s, -t, +u$, &c. be the co-efficients of the 2d, 3d, 4th, 5th, 6th, 7th, &c. terms of any equation, then shall p be the sum of all the roots, q the sum of the products of any two, r the sum of the products of any three, s the sum of the products of any four, &c. Accordingly, in any equation given to be resolved, the sum of the roots may be easily found, as it is equal to the co-efficient of the second term having its sign changed; and so also may be the sum of the products which are made by the multiplication of any determinate number of them. Thus the sum of the squares is always $p^2 - 2q$. For call it B, the sum of the roots being p as before, then, as the square of the sum of any two quantities can be demonstrated to be equal to the sum of their squares added to double the products made by multiplying them together, we have $p^2 = B + 2q$, and therefore $B = p^2 - 2q$; whence B, that is the sum of the squares, can be found by subtracting $2q$ from p^2, and the quantities represented by p and q, are always known, as they are the co-efficients in the proposed equation. Again, the sum of the cubes of the roots is equal to $p^3 - 3pq + 3r$, or to $Bp - pq + 3r$, as is thus shewn. $\overline{B-q} \times p$ gives the excess of the sum of the cubes of any quantities above the triple sum of the products made by multiplying any three of them together. So $\overline{a^2 + b^2 + c^2 - ab - ac - bc} \times \overline{a + b + c}\,(= \overline{B - q} \times p) = a^3 + b^3 + c^3 - 3abc$. Call the sum of the cubes C, and then we have $\overline{B - q} \times p = C - 3r$, and therefore $C = Bp - qp + 3r$; but $B = p^2 - 2q$, and substituting this, we find $C = p^3 - 3pq + 3r$.

In the same way, if D be the sum of the 4th power of the roots, we have it $= p\,C - q\,B + pr - 4s$; and if E be the sum of the 5th power we have it $= p\,D - q\,C + r\,B - ps + 5t$, &c. The signs of the terms in the table are all alternately + and —, which is always the case when the roots are positive; but when the roots are all negative, in which case, $\overline{x+a} \times \overline{x+b} \times \overline{x+c}$, &c. $= o$, there will be no change in the signs of the terms, all of them being positive. So that, in general, there are as many positive roots in any quadratic equation as there are changes in the signs of the terms from + to —, or from — to +, and the remaining roots are negative. Thus, in $(\overline{x-a} \times \overline{x-b} =)\ x^2 \left.\begin{matrix}-ax\\-bx\end{matrix}\right\} + ab = o$, where there are two changes of the signs, the two roots are both positive: in $(\overline{x+a} \times \overline{x+b} =)\ x^2 \left.\begin{matrix}+a\\+a\end{matrix}\right\} x + ab = o$, where there is no change of the signs, the roots are both negative; and in $(\overline{x-a} \times \overline{x+b} =)\ x^2 \left.\begin{matrix}-a\\+b\end{matrix}\right\} x - ab = o$,

where there is one change of the signs, one root is positive and one negative. In cubic equations, all the roots may be positive, as in $\overline{x-a} \times \overline{x-b} \times \overline{x-c} = o$; where the signs are alternately + and —, and there are three changes in the signs; all the roots may be negative, as in $x \overline{+a} \times x \overline{+b} \times \overline{+\ c} = o$; where there is no change in the signs, there may be two positive roots, and one negative, as in $\overline{x-a} \times \overline{x-b} \times \overline{x+c} = o$, which gives

$$x^3 \left.\begin{matrix}-a\\-b\\+c\end{matrix}\right\} x^2 \left.\begin{matrix}+ab\\-ac\\-bc\end{matrix}\right\} x + abc = o,$$

where there are two changes in the signs, whether $a + b$ be greater than c, in which case the second term must be negative, and its co-efficient being $-a - b - c$; or whether it be less than c, in which case, the third term is negative, its co-efficient $+ab - ac - bc\ (ab - c \times \overline{a+b})$ being negative; and, lastly, there may be one positive root and two negative roots, as in $\overline{x+a} \times \overline{x+b} \times \overline{x-c} = o$, which gives

$$x^3 \left.\begin{matrix}+a\\+b\\-c\end{matrix}\right\} x^2 \left.\begin{matrix}+ab\\-ac\\-bc\end{matrix}\right\} x - abc = o,$$

where there must be always one change of the signs, the first term being positive, and the last negative, but can be no more than one change, for if the second term is negative, or $a + b$ less than c, the third must also be negative. If any term of an equation is wanting, the positive and negative parts of its co-efficients must be equal; and if there is no absolute term in an equation, that is, one in which the unknown quantity does not enter, then some of the roots must be $= o$, in which case the equation may be depressed by dividing all the terms by the lowest power of the unknown quantity in any of them; and in which case also, $x - o = o$ may be considered as one of the component and simple equations, by which the given equation may be divided and depressed.

By the *transformation* of equations is signified a method of forming equations which shall have all their roots greater or less, by a given quantity, than the roots of other equations, and, accordingly, is one of the modes by which equations are resolved. It comprehends, among others, the following useful propositions.

1. The roots of an equation are changed from affirmative to negative, or from negative to affirmative, by simply changing the sign of the alternate terms, beginning with the second, but still retain the same value. This depends on a principle already explained, by which it appears, that the co-efficients of the second terms, and all the terms taken alternately from them, involve the products of an odd number of the roots.

2. One equation may be transformed into another which shall have its roots greater or less than those of the original equation by some given difference.

Thus, let it be proposed to transform the equation $x^3 - px^2 + qx - r = o$ into an equation the roots of which shall be less than those of the given equation by the difference e. Take $y = x - e$ and therefore $x = y + e$; then, for x and its powers, substitute this equivalent and its powers, and we shall obtain this new equation:

$$\left.\begin{array}{rrrr} y^3 & +3ey^2 & +3e^2y & +\ e^3 \\ & -py^2 & -2pey & -\ pe^2 \\ & & +qy & +\ qe \\ & & & -\ r \end{array}\right\} = o = \left\{\begin{array}{l} x^3 \\ -px^2 \\ +qx \\ -r \end{array}\right.$$

in which it is obvious the roots are less than those of the given equation by the difference e. Had it been proposed that the roots of the new equation should be greater by the same difference, we must have taken $y = x + e$, and, consequently, $x = y - e$, when the new eqûation would have been

$$\left.\begin{array}{rrrr} y^3 & -3ey^2 & +3e^2y & -\ e^3 \\ & -py^2 & +2pey & -\ pe^2 \\ & & +qy & -\ qe \\ & & & -\ r \end{array}\right\} = o = \left\{\begin{array}{l} x^3 \\ -px^2 \\ +x \\ -r \end{array}\right.$$

in which it is equally obvious the roots are greater by e than those of the original equation. One use of this process is to shew how the second, or any other intermediate term, may be taken away from an equation. For example, the co-efficients of the second term in the above equation involve the powers of e and known quantities only, for the term is $\overline{3e - p} \times y^2$, where the co-efficients $3e - p$ are known. Now, let these co-efficients be put equal to nothing, that is, $3e - p = o$, consequently, $e = \frac{1}{3}p$; and substituting this for e, we shall find the second term vanish, or, in other words, the new equation will want the second term. The same thing can be proved in other cases, and it follows universally that in any cubic equation, the co-efficient of the first term being 1, and x the unknown quantity, the second term may be exterminated by adding to x the third part of the co-efficient of the second term, with its proper sign, namely $\mp \frac{1}{3}p$, supposing y equal to this aggregate, from the value of y finding that of x by transposition, and substituting this value of x and its powers in the given equation. It can thus be shewn that the second term may be easily taken away; and it is clear, that if the second term of a quadratic be taken away, the equation becomes pure, and so resolvable on the principle formerly laid down. Again, the third term may be taken away in a similar manner. For in $x^3 - px^2 + qx - r = o$, let $y = x - e$, and the co-efficient of the third term will be the quadratic $3e^2 - 2pe + q$. Suppose this equal to nothing, and find by resolution the value of e, which being substituted for it in the equation $y = x - e$, will yield an equation that shall want the third term. Thus, then, the third term may be taken away by the solution of a quadratic; and it can, in like manner, be shewn, that the fourth term may be taken away by the solution of a cubic equation, the fifth by that of a biquadratic, &c.

3. One equation may be transformed into another, the roots of which shall be equal to those of the original equation, either multiplied or divided by a given quantity. This is effected by supposing y equal to the unknown quantity multiplied or divided by the given quantity, that is $y = xe$, or $y = \frac{x}{e}$, e representing the given quantity; taking $x = \frac{y}{e}$, or $x = ye$, substituting these values of x for it in the proposed equation, which will obviously have the quality required. By this method, it might be easily proved, an equation may be freed of fractions and sometimes also of surd co-efficients. And generally, therefore, it could likewise be proved, the roots of any equation can be increased and diminished, multiplied and divided, by any given quantity, and also changed into their reciprocals.

On these principles are founded some of the most useful rules for the resolution of equations. For example;—As the last or absolute term of an equation is the product of its roots, it results that the roots of an equation, when commensurate, will be found among the divisors of the last term. Bring, therefore, all the terms of an equation to one side, find all the divisors of the last or absolute term, and substitute them successively in the equation for the unknown quantity: that divisor which gives the result $= o$ shall be the root of the equation; and when one root is thus found, we may find the other roots by dividing the proposed equation by the simple equation deduced from the root already found, when the quotient will be an equation of a degree lower than the proposed one the roots of which give the roots required. Thus, suppose the roots of the cubic equation $x^3 - 2x^3 - 33x + 90 = 0$ were required. In the first place, the divisors of 90, which forms the absolute term, are 1, 2, 3, 5, 6, 9, 10, 15, 18, 30, 45, 90. Now, to take the first of these, namely 1, and substitute it for x, we find $x^3 - 2x^2 - 33x + 90 = 1 - 2 - 33 + 90 = 56$, whence it appears that 1 is not a root of the equation. Take then 2, the next divisor, substitute it for x, and we have $x^3 - 2x^2 - 33x + 90 = 8 - 8 - 66 + 90 = 24$, whence it also appears that 2 is not a root of the equation. We then make trial of 3, when we find $x^3 - 2x^2 - 33x + 90 = 27 - 18 - 90 + 90 = 0$, so that we discover 3 to be one of the proposed roots. For now $x = 3$, or $x - 3 = 0$. Divide the equation thereby thus:

$$\begin{array}{l|l} x^3 - 2x^2 - 33x + 90 & x - 3 \\ \cline{2-2} & x^2 + x - 30 \\ \underline{x^3 - 3x^2 \qquad\qquad} & \\ \qquad x^2 - 33x & \\ \qquad \underline{x^2 - 3x \qquad} & \\ \qquad\quad -30x + 90 & \\ \qquad\quad \underline{-30x + 90} & \end{array}$$

and we obtain for a quotient the quadratic $x^2 + x - 30 = o$, which must be the product of the other two simple equations whence the original cubic is generated, and the roots of which must be two of the roots of that cubic. To obtain these, then, we proceed as formerly directed.

$$x^2 + x = 30$$

Comp. the sq. $x^2 + x + \frac{1}{4} = 30 + \frac{1}{4} = \frac{121}{4}$

Ext. the sq. r. $x + \frac{1}{2} = \pm \sqrt{\frac{121}{4}} = \pm \frac{11}{2}$, and,

therefore, $x = \pm \frac{11}{2} - \frac{1}{2} = + 5$, or $- 6$.

But the process of trying many divisors is necessarily tedious and troublesome. We may abridge it by practising the following rule: Substitute for the unknown quantity successively the terms of the progression 1, 0, — 1, &c. and find all the divisors of the sums which result; then take out all the arithmetical progressions found among these divisors, the common difference of which is 1, and the values of x will be among those terms of the progression which are the divisors resulting from substituting $x = o$; these values of x will be affirmative when the arithmetical progression increases, and negative when it decreases. It will be proper to exemplify this. Divide 16 into two parts, such that the cube of the one shall exceed the cube of the other by 386. Let x be the greater part, and, therefore, $16 - x$ the less. We have then

$$x^3 - \overline{16 - x}\,|^3 = 386$$

By involut. $2x^3 - 48x^2 + 768x - 4096 = 386.$

By transp. and divis. $\}$ $x^3 - 24x^2 + 384x - 2241 = 0$

Suppos.	Results.	Divisors.	Arithm. Progres.
$x = +1$; ...	1880	1, 2, 4, 5, 8, 10, 20,	4. 8.
$x = \ \ 0$; ...	2241	1, 3, 9, 27, 83,	3. 9.
$x = -1$; ...	2650	1, 2, 5, 10, 25, 53,	2. 1.

Here we have two arithmetical progressions among the divisors, one decreasing, viz. 4, 3, 2, and the other increasing, viz. 8, 9, 10. Our object is clearly to obtain an affirmative quantity, and, therefore, we take 9 for the value of x, which being inserted for it, accordingly, gives the equation $= 0$. Whence we conclude the numbers to be 9 and 7, which will be found to answer the conditions, for $9^3 = 7^3 + 386 = 343 + 386 = 729$; and so, $x - 9 = 0$ is one of the simple equations from which the cubic $x^3 - 24x^2 + 384x - 2241 = 0$ is produced. Dividing this cubic by $x - 9$, we obtain the quadratic $x^2 - 15x + 249 = 0$, the two roots of which are impossible.

It is frequently convenient to depress the higher equations, by finding, if not the simple equations that produce them, yet the quadratic, the cubic, or biquadratic, which are divisors of them; for in this manner we may depress still lower, and so render the solution more easy. The foundation of the most useful rules on the subject is, that if an arithmetical progression is assumed, such as a, $a + e$, $a + 2e$, $a + 3e$, &c. the first differences of their various powers will also be in arithmetical progression. Suppose, then, $mx - n$, $mx^2 - nx + r$, $mx^3 - nx^2 + rx - s$, to be respectively the simple, quadratic, and cubic equations, which are divisors of a given equation, and let B represent the quotient arising from dividing the equation thereby; then shall we have $B \times \overline{mx - n}$, $B \times \overline{mx^2 - nx + r}$, or $B \times \overline{mx^3 - nx^2 + rx - s}$, to represent the equation itself, in which it is evident that as m is the co-efficient of the highest term of the divisors, it must also be a divisor of the co-efficient of the highest term of the given equation. Farther, supposing the equation to have a simple divisor, as $mx - n$, if, in place of x, any quantity, as a, be substituted in the equation $B \times \overline{mx - n}$, the quantity which will result must have $ma - n$, for one of its divisors, or if we substitute $a - e$, $a - 2e$, &c. the terms of an arithmetical progression, we shall have, as divisors of the resulting quantities, $ma - me - n$, $ma - 2me - n$, &c. which are also in arithmetical progression. The same thing will happen if for x we substitute 1, 0, — 1, &c. the terms of an arithmetical progression, for then the quantities that result will have among their divisors $m - n$, $-n$, $-m - n$, or $n - m$, n, $n + m$, where the common difference of the terms is m, and the term belonging to the supposition of $x = o$ is n. Consequently, if, in any equation which has a simple divisor, we substitute 1, 0, — 1, for x, there will in the divisor of the results be discovered one arithmetical progression at least, the common difference of the terms of which will be unit, or a divisor m of the co-efficient of the highest term, and which will be the co-efficient of x in the simple divisor required, the term of which, again, that arises from the supposition of $x = o$ will be n, the other member of the simple divisor $mx - n$. If the equation have no simple divisor, and is at the same time of higher dimension than a cubic, we must inquire whether there be any quadratic which will divide it; and this is to be sought for by substituting for x the terms 2, 1, 0, — 1, &c. successively finding all the divisors of the results, adding them to and subtracting them from the squares of these numbers, multiplied by a numerical divisor of the highest term of the given equation, and taking out all the arithmetical progressions to be found among the sums and differences; then, supposing r to be that term in any progression arising from the substitution of $x = o$, putting $\pm n$ for the difference between that term and the preceding term in the progression, and taking m for the divisor of the highest term of the equation, and which is supposed to be known, as it is unit or the coefficient of that term, we obtain as a divisor which may be tried on the equation $\overline{mx^2 \pm nx - r}$. An example will prove this process to be much more easy than it seems when described as a rule; and this remark, it may be proper to add, applies very extensively to the investigation and operations of mathematical science. It is proposed to discover the quadratic divisor, if it have one, of the biquadratic $x^4 - 5x^3 + 7x^2 - 5x - 6 = o$, which has no simple divisor. The suppositions of $x = 2$, $= 1$, $= o$, $= -1$, give us respectively, as

Squares.	Results.	The divisors of which are	Sums and differences of the Divisors and Squares.	Arithmetical Progression.			
4	—12	1, 2, 3, 4, 6, 12	— 8, —2, 0, 1, 2, 3, 5, 6, 7, 8, 10, 16	8	1	—8	3
1	— 8	1, 2, 4, 8	— 7, —3, —1, 0, 2, 3, 5, 9	5	—1	—7	2
0	— 6	1, 2, 3, 6	— 6, —3, —2, —1, 1, 2, 3, 6	2	—3	—6	1
1	+12	1, 2, 3, 4, 6, 12	—11, —5, —3, —2, — 1, 0, 2, 3, 4, 5, 7, 13	—1	—5	—5	0

Here, the first arithmetical progression gives the divisor $x^2 - 3x - 2$, and the second $x^2 - 2x + 3$, both which succeed, and therefore the roots of the two equations, $x^2 - 3x - 2 = o$ and $x^1 - 2x + 3 = o$, namely, $\frac{3 \pm \sqrt{17}}{2}$ and $1 \pm \sqrt{-2}$, are the four roots of the given equation, and the two last of them are impossible. The manner of discovering the cubic divisors, or those of higher dimensions of any equation is similar. Suppose we have $mx^5 - nx^2 + rx - s$. Thus

Supposition.	Results.	Cubes of Terms in Prog. *xm*.	1st Difference.	2d Difference.	5d Dif.
$x = 3$	$27m - 9n + 3r - s$	$27m$	$9n - 3r + s$	$5n - r$	$2n$
$x = 2$	$8m - 4n + 2r - s$	$8m$	$4n - 2r + s$	$3n - r$	$2n$
$x = 1$	$m - n + r - s$	m	$n - r + s$	$n - r$	$2n$
$x = 0$	$-s$	o	$+s$	$-n - r$	
$x - 1$	$-m - n - r - s$	$-m$	$n + r + s$		

Here the first differences are not in arithmetical progression as in the former case, but the second differences are, the common differences being $2n$, from which n is known. We find r, therefore, in the column of these second differences; and s is assumed as a divisor of the last term of the given equation, m being as before the co-efficient of the first term. We obtain, then, $mx^5 - nx^2 + rx - s$, as the divisor, with which trial is to be made.

When the divisors of the equation involve more letters than one, we proceed on the same principle to find a divisor, one of the letters being supposed equal to unit, after which, completing the dimensions of the divisor, we substitute the latter again for unit, and obtain the divisor required. As $8x^3 - 26ax^2 + 11a^2x + 10a^3 = o$, supposing $a = 1$, becomes $8x^5 - 26x^2 + 11x + 10 = o$; the divisor of which will be found to be $2x - 5$. Accordingly, multiplying the term -5 by $+a$, we bring it to the same dimensions, and obtain the divisor $2x - 5a$. Several other methods have been proposed for the resolution of the higher orders of equations; and this branch of the analytic art has long exercised the ingenuity of some of the ablest mathematicians of modern times.

Suppose x any indeterminate or variable quantity, and that A, B, C, D, &c., and also that a, b, c, d, &c. are quantities entirely independent of x, and that we have this general equation, $A + Bx + Cx^2 + Dx^3$, &c. $= a + bx + cx^2 + dx^3$, in which the same powers of the same variable quantity are found on both sides, &c. Then if $A = a$, the coefficients of the same powers of the variable quantity will all be equal, that is B to b, C to c, D to d, &c. For here, it is obvious, the value of x does not affect the equation, which remains the same however x may vary, and whether $x = o$, in which case all the terms vanish except the first, and we have $A = a$. But take away these two equal quantities from the equation, and we have $Bx + Cx^2 + Dx^5$, &c. $= bx + cx^2 + dx^5$, and which divided by x, gives $B + Cx + Dx^2$, &c. $= b + cx + dx$, &c. whatever be the value of x. Let then, again, as before, $x = o$, and all the terms vanish except the first, viz. $B = b$. In the same manner we might proceed throughout the whole series. Accordingly, if we bring all the quantities to one side, we shall have $A - a + (B - b)\ x + (C - c)x^2 + (D - d)\ x^3 = o$, &c., and so $A - a = o$, $B - b = o$, $C - c = o = D - d = o$, &c. On this method, which is denominated that of indeterminate co-efficients, is founded the doctrines of *infinite series*, and approximation to the roots of equations. In order to understand its application, let it be considered that if, in any equation, two numbers being substituted for the unknown quantity give results with opposite signs, there must be an odd number of roots between these numbers. The reason of this has been shewn in speaking of the property of the absolute or last term, and follows also from this principle, that if a number of quantities be multiplied together, and the signs of an odd number of them be changed, the sign of the product is changed. The first step, then, towards the approximation, is the discovery of the nearest integer to a root of a given numeral equation. For example, if the two roots of the equation $x^2 - 16x + 55 = 0$ are required. Here we find the limits of the two roots, one between 0 and 8 for the least, and between 8 and 17 for the greatest; and that, with respect to the former, any number between 0 and 8 that gives a positive result must be less than it, and any number that gives a negative result must be greater. Now, by successive trials, therefore, we shall perceive that the former lies between 4 and 6, for that 4 gives a positive result and 6 a negative. We substitute 5 accordingly in place of x, and find this to give $x^2 - 16x + 55 = 25 - 80 + 55 = 0$; whence it appears 5 is the least root, and from this we ascertain the other. Thus, then, by diminishing the greater, or increasing the less limit, we discover the true root when it is commensurable: and when it is not so, which we conclude when we obtain two limits, one greater than the root and the other less, which however differ from one another by unit, we approximate the root by continuing the operation in fractions, or by transforming the equation into another the roots of which shall be equal to 10,100, or 1000 times the roots of the original, and taking the limits of them greater in the same proportion. This transformation is easily made, for we have only to multiply the second term by 10, 100, or 1000, the third term by the square thereof, the fourth by the cube, &c. To exemplify both processes, suppose $x = 2$, in the equation $x^2 - 6x + 7 = 0$; we have for a result $4 - 12 + 7 = -1$, which is negative, whereas the result when $x = 0$ is positive. We conclude, therefore, the root to be between 0 and 2. Try, then, $x = 1$; and the result is $1 - 6 + 7 = 2$ also positive, whence it seems the root is incommensurable. To approximate it, we suppose $x = 1\frac{1}{2}$, and find as a result $x^2 - 6x + 7 = 2\frac{1}{4} - 9 + 7 = \frac{1}{4}$ still positive, so that the root must be betwixt 2 and $1\frac{1}{2}$. Let us try $1\frac{3}{4}$. Thus we find $x^2 - 6x + 7 = \frac{49}{16} - \frac{42}{4} + 7 = 3\frac{1}{16} - 10\frac{8}{16} + 7 = -\frac{7}{16}$, which is negative. The root, then, must be between $1\frac{3}{4}$ and $1\frac{1}{2}$. Try $1\frac{5}{8}$, and the result will be found negative; so that the root must be $1\frac{1}{2}$ and $1\frac{5}{8}$. We therefore try $1\frac{9}{16}$, and the result being positive, we conclude the root to be between $1\frac{9}{16}$ and $1\frac{10}{16}$, and consequently that it is very nearly $1\frac{19}{32}$. The process of transformation may be illustrated on the same equation. Here then we have $x^2 - 600x + 70000 = 0$, the roots of which are 100 times greater than those of the proposed equation, and the limits of which are 100 and 200. Proceeding, then, as before, we try 150 for the root of x, and find the result to be $22500 - 90000 + 70000 = 2500$, whence it seems that 150 is less than the root. If we take 175 for our next trial, we obtain a negative result, so that 175 must be greater than the root. Proceeding in the same way, we find the root must be between 158 and 159, consequently infer the least root of the equation $x^2 - 6x + 7 = 0$ to be between 1.58 and 1.59, being the hundreth part of the root of $x^2 - 600x + 70000 = 0$. We may on the same principle, only using other limits, discover the other roots of an equation. For example, in the equation $x^3 - 15x^2 + 63x - 50 = 0$, having found the least root to be nearly 1.028039, we may ascertain the middle root, the limits of which are 6 and 7. Suppose then f to represent the difference betwixt the real value of x and the number which we find nearly equal to it, and here then $x = 6 + f$, f being in this case less than unit. Substituting this value for x, we find $f^3 + 3f^2 - 9f + 4 = 0$, consequently $f = \frac{4}{9}$ nearly, or $= \frac{4}{9 - 3f - f^2} = \frac{4}{9 - \frac{3}{4} - \frac{16}{81}} = \frac{324}{605}$. Consequently $x = 6 + \frac{324}{605}$ nearly; and this value might be corrected if necessary. Generally, the value of the roots is approximated sooner by taking the three last terms of the equation, and extracting the root of the quadratic equation consisting of them. Both methods may be easily shewn. Thus, in the equation $x^3 - 15x^2 + 63x - 50 = 0$. Let $x = 1 + f$, f being supposed less than unit, and substitute. Thus we have

$$\begin{aligned} x^3 &= 1 + 3f + 3f^2 + f^3 \\ -15x^2 &= -15 - 30f - 15f^2 \\ +63x &= 63 + 63f \\ -50 &= -50 \\ \hline x^3 - 15x^2 + 63x - 50 &= -1 + 36f - 12f^2 + f^3 = 0. \end{aligned}$$

Omitting the powers of x in this approximation, and assuming only the two first terms, we have $-1 + 36f = 0$, or $f = \frac{1}{36} = .027$: but more nearly still, if we take the three last terms of the equation, we find $f = 0.28031$: and this method applies to all equations.

We may now, therefore, deduce a general theorem for approximating to the roots of equations of any degree. Let $f^3 - pf^2 + qf - r = 0$ represent the equation, by which the fraction f is to be determined, f being either to be added to or subtracted from the limit, in order to obtain the near value of x. Here $qf - r = 0$, and so $f = \frac{r}{q}$. But $f = \frac{r}{f^2 - pf + q}$; substituting $\frac{r}{q}$ for it, then, we have this theorem for finding f nearly,

$$f = \frac{r}{\frac{r^2}{q^2} - \frac{pr}{q} + q} = \frac{q^2 \times r}{q^3 - pqr + r^2}$$

If the equation is a biquadratic, by which we are to determine f, as $f^4 - pf^3 + qf^2 - rf + s = o$, then f being very small, we have it $= \frac{s}{r}$, and we may correct this by considering, that as $f = \frac{s}{r - qf + pf^2 - f^3}$, so substituting $\frac{s}{r}$ for it, we have $f = \frac{s}{r - \frac{qs}{r} + \frac{ps^2}{r^2} - \frac{s^3}{r^3}}$; and thus we obtain, as a theorem for all biquadratics,

$$f = \frac{r^3 \times s}{-s^3 + ps^2r - qsr^2 + r^3}$$

And for the resolution of equations of any dimensions we obtain a general theorem and formula, which may be thus represented and described. Let $x^n + px^{n-1} + qx^{n-2} + rx^{n-3} +$, &c. $+ A = o$ be an equation of any dimensions denoted by n, and A represent its absolute known term. Let k be the limit next less than any of the roots, and suppose $x = k + f$. Substitute this value of x for x, and its powers for the powers of x, and there will arise $\overline{k+f}^n + p \times \overline{k+f}^{n-1} + q \times \overline{k+f}^{n-2} + r \times \overline{k+f}^{n-3}$, &c. $A = o$, in which, as f is less than unit, we may neglect all its powers except those in the two first terms, and whence we may deduce particular theorems for approximating the roots of equations to any assigned or required degree of accuracy.

Newton, to whom we are indebted for this method of approximating to the roots of equations, neglected all the terms which contained the second and higher powers of the small differences assumed as part of their values, and operated on those only which contained the first power and the absolute or known term. In this manner he deduced the value of the assumed quantity from a simple equation, and the process was an easy one. Dr Halley adopted the same general method, but comprehended also the second power or square of the assumed difference, so that he approached nearer to its real value; but he did so by the solution of a quadratic equation, and therefore in a more troublesome way. Another plan was suggested by Raphson, somewhat different from Newton's. He found a near value of the first assumed small quantities, and by this he corrected the first approximation to the root of the proposed equation; then assuming another letter for the next difference, he introduced it into the original equation as before; and in this manner he proceeded from one correction to another, always using the first proposed equation to find them, instead of having recourse to successive new equations with Newton. These two methods are illustrated by Ludlam, who

Equations.

also proposes another as more convenient than either. Required the root of the equation $x^3 - 5x - 31 = o$. Here we find x greater than 8, but less than 9. Putting, therefore, for x, the quantity $8 + z$, we have

$$\begin{array}{r}
x^2 = 64 + 16z + z^2 \\
-5x = -40 - 5z \\
-31 = -31 \\
\hline
x^2 - 5x - 31 = -7 + 11z + z^2 = o
\end{array}$$

Neglecting z^2, according to Newton, we have $11z - 7 = o$, consequently $z = \frac{7}{11} = {\cdot}6363$, or $\cdot 6$ nearly. Assuming now, therefore, $z = {\cdot}6 + y$, we have

$$\begin{array}{l}
z^2 = {\cdot}36 + 1{\cdot}2y + y^2 \\
11z = 6{\cdot}6 + 11y \\
-7 = -7 \\
\hline
z^2 + 11z - 7 = -{\cdot}04 + 12{\cdot}2y + y^2 = o
\end{array}$$

From which, by rejecting y^2, we obtain

$$y = \frac{{\cdot}04}{12{\cdot}2} = {\cdot}003278 \text{ nearly.}$$

Now, assuming this value of y, we get

$$\begin{array}{l}
y^2 = {\cdot}000010745284 - {\cdot}006556\,v + v^2 \\
12.2y = {\cdot}0399916 \quad - 12{\cdot}20 \\
-.04 = .04 \\
\hline
4^2 + 12.2y - {\cdot}04 = {\cdot}000002345284 - 12{\cdot}206556 \\
v + v^2 = o;
\end{array}$$

whence $v = \frac{000002345284}{12{\cdot}206556} = 000000192133$;

and, then collecting all the assumed differences with the signs, we find $x = 8 + z + y - v = {\cdot}8 + {\cdot}6 + {\cdot}003278 - {\cdot}000000192133 = 8{\cdot}6003277807867$.

The same equation treated on Raphson's method. First, we have, as before, $x = 8 + z$, consequently,

$$\begin{array}{r}
x^2 = 64 + 16z + z^2 \\
-5x = -40 - 5z \\
-51 = -31 \\
\hline
\end{array}$$

$x^2 - 5x - 31 = -7 + 11z + z^2 = o$, and, therefore, $z = \frac{7}{11} = 6$ nearly. Assume, then, $x = 8{\cdot}6 + y$, and we have

$$\begin{array}{r}
x^2 = 73{\cdot}96 + 17{\cdot}2y + y^2 \\
-5x = -43 - 5y \\
-31 = -31 \\
\hline
\end{array}$$

$x^2 - 5x - 31 = -{\cdot}04 + 12{\cdot}2y + y^2 = o$, and so $y = \frac{{\cdot}04}{12{\cdot}2} = {\cdot}003278$ nearly, and so $x = 8{\cdot}6 + y = 8{\cdot}603278$ nearly.

Suppose, then, $x = 8{\cdot}603278 - v$, and then

$$\begin{array}{l}
x^2 = 74{\cdot}016392345284 - 17{\cdot}206556\,v + v^2 \\
-5x = -43{\cdot}01639 \qquad + 5v \\
-31 = -31 \\
\hline
\end{array}$$

$x^2 - 5x - 31 = {\cdot}000002345284 - 12{\cdot}206556\,v + v^2 = o$, and so $v = {\cdot}000000122133$, and therefore $x = 8{\cdot}603277807867$, as before.

According to Ludlam, we have, 1st, to find by trial a number nearly equal to the root required. 2. Calling this r, we conceive z to be equal to the difference between it and the true root x. Then, 3. instead of x we substitute $r \pm z$, and obtain an equation which involves only z and known quantities. 4. Rejecting all those quantities in which there are two or more dimensions of z, we obtain the value of z in a simple equation. 5. Adding this value to that of r, we get the root required nearly: And, 6. If this approximated value be not sufficiently near, we repeat the operation by substituting it in place of r in the equation which exhibits the value of z, and so obtain a second correction for the root required. Thus, in the same example, having, as before, found the value of x nearly equal to 8, we put $r = 8$, and $r + z = x$, and so

Figured Space.

$$\begin{array}{l}
x^2 = r^2 + 2rz + z^2 \\
-5x = -5r - 5z \\
-31 = -31 \\
\hline
x^2 - 5x - 31 = r^2 + 2rz - 5r - 5z - 31 = o
\end{array}$$

or $z = \frac{31 + 5r - r^2}{2r - 5} = \frac{31 + 40 - 64}{16 - 5} = \frac{7}{11} = {\cdot}6$, and $r = 8{\cdot}6$ nearly. Substituting this value of r in the last equation, we have $z = \frac{31 + 5r - r^2}{2r - 5} = \frac{31 + 43 - 73{\cdot}96}{17{\cdot}2 - 5} = \frac{{\cdot}04}{12{\cdot}2} = {\cdot}0032$, and $x = 8{\cdot}6 + {\cdot}0032 = 8{\cdot}6032$ nearly.

If, again, this value be substituted for r, we get $z = 0000077808$, and $x = 8{\cdot}603277808$, very nearly; and so we might proceed to any degree of accuracy thought necessary.

One of the most general methods of extracting the roots of equations was proposed a few years ago by Mr Peter Nicholson, to whose Analytical Essays and Course of Mathematics we must refer the studious reader.

We now proceed to the other great branch of mathematics proposed for consideration,—that on which we have bestowed the title of

FIGURED SPACE.

Here, abstracting our minds entirely from all regard to any of the qualities of body save those of form and dimension, we represent magnitude and its relations by lines, as we represented them before by figures and letters. The symbolical characters used to denote the operations on magnitude may be employed in both, as may also any ordinary language for which these characters are substituted, with a view not less to distinctness of signification than brevity of expression. We do not now inquire by what faculty or faculties we obtain a knowledge of the properties of external objects, or by what process we decompose the complex ideas respecting them, so as to arrive at the simple abstractions which serve for the basis of this science. It is enough for us to remark generally, that we are indebted to observation for the elementary principles on which this science proceeds; but that having thereby once become familiar with a few facts, the reasoning founded on them may ever afterwards be carried on without a single reference to the intimations of the senses, though it is freely admitted these may frequently prove useful, not by verifying our conclusions, but by aiding the mind in recollecting and tracing the steps by which we arrived at them. The solid bodies around us, besides indicating other qualities, excite in us the idea of extension, or, more generally speaking, expansion; and this is implied in the word *surface,* which, again, judged of merely in relation to form and magnitude, presents us with terminating or defining limits, usually called lines. These are either straight, that is, such as hold a direct undeviating course, or inclined to one side or other, that is, which deviate from any direction, and generally denominated bent, crooked, or curved. Lines of either kind commence in or are terminated at certain positions, to which we apply the name of points. These merely indicate position, and are conceived to have no magnitude; as lines indicate distance or elongation, and are conceived to have no breadth; while surfaces represent merely extension, and are conceived to have no bulk; and, lastly, what are styled solids, are conceived to possess all the qualities of magnitude, length, breadth, and thickness.

A point, taken singly, admits of no other inference or conclusion, than that such is a position or mark in space. Two points, considered in relation to each other, besides indicating two positions, determine a straight line between them. Three or more points determine the position and form of a surface; and to a surface so constituted, that if any two points be assumed in it, the straight line drawn between them shall lie altogether in the surface, the term *plane,* or plane surface, is applied.

Lines may vary in length, so that one may be conceived to be greater or less than another by any assignable difference. They may also be conceived as commencing at the same point, but taking different directions, so as to terminate in different points, and they may likewise both commence and terminate at different points. Lines taking different directions may meet or intersect each other. When they do so, they are said to form an angle or angles, by which is to be understood the separation or opening they form at the point of their intersection, generally called the vertex of the angle or angles so constituted, as the lines forming them are called sides. Those angles may vary in magnitude, so that one may be larger or less than another; and they may consequently be multiplied and divided; and it is often found convenient both to specify the magnitude of one angle, judged of in relation to another or to a particular standard, and also to discriminate one from another, when presented either at the same point of intersection or at different positions. Thus, when one straight line meeting another straight line forms an angle on one side which is equal to that on the other, we have what is called a right angle; and hence it is evident, that any one right angle must be equal to every other right angle. The line which falls on another line, so as to form a right angle, is called a perpendicular to it. The angle which is less than a right angle is called an acute angle, and that which is greater than a right angle is called an obtuse angle; and it is evident that the acute and the obtuse angle, formed by one line falling obliquely on another, do together make up two right angles. But it is equally evident, that if the line which thus falls on another be produced so as form with it on the other side two angles, these two angles shall also, when taken together, be equal to two right angles. Hence, then, all the angles which one line can form with another by intersecting it, or, still more extensively, all the angles which can be formed at a point where two or any number of lines intersect each other, are equal to four right angles. One side of an angle forms on the other side produced, a supplemental or exterior angle; and a vertical angle is formed by the production of both its sides. It is usual to designate an angle by three letters, the middle one of which denotes the point at which the lines forming it meet, the other letters being employed, together with that one, to designate the sides or lines forming the angle. Thus, in (Fig. 1. Pl. 117.) in which the line C D is perpendicular to the line A D, and intersects it at E, we designate the angles respectively formed by them by the letters A E D, A E C, B E D, B E C: and so also in Fig. 2. where the line C D falls obliquely on A B, and intersects it at E, so as to form with it two obtuse angles, namely, A E D and B E C, and two acute angles, namely, A E C and B E D. Here the angle A E C is vertical to B E D, and A E D is vertical to B E C; also B E C is supplemental or exterior to A E C, and A E D is supplemental to B E D. It is evident that vertical angles are equal; for the angles A E C and B E C, which stand on the straight line A B, being equal to two right angles, are equal to A E C and A E D; taking away, therefore, A E C, which is common, we have A E D equal B E C; and, in the same way, it may be proved that A E C is equal to B E D. Two straight lines are said to be inclined to each other when they meet if produced, and the angle formed by them is called their inclination. Straight lines which have no inclination, or which, however produced, in place of meeting each other, always retain the same distance, are called parallel. A space cannot be comprehended by less than three straight lines, so as to form a figure, by which is signified a plane surface, included by a linear boundary called its perimeter. The simplest of all rectilineal figures, therefore, is a triangle, which is contained by three straight lines, and has three angles. When two sides of a triangle are equal, the triangle is an isosceles triangle: when all the three sides are equal, it is an equilateral triangle; if all the sides are unequal, it is a scalene triangle. Farther, a triangle is called right-angled when it has a right angle for one of its angles, obtuse-angled when one of its angles is obtuse, and acute-angled when all its angles are acute. Two triangles are said to have the same affection when they are both possessed of a right angle or an obtuse angle, or in which all the angles are acute. Any side of a triangle may be called its base, and the opposite angular part is termed its vertex, and the side opposite a right angle is called the hypotenuse. Any plane figure bounded by four right lines is called a quadrilateral. Of quadrilaterals there are various species, as a trapezoid, which has two parallel sides; a trapezium, which has two of its sides parallel and two of them equal, though not parallel; a rhomboid, or parallelogram, which has its opposite sides equal; a rhombus, which has its four sides equal; an oblong, or rectangle, which has a right angle, and its opposite sides equal; and a square, which has a right angle, and all its sides equal. The straight line is called a diagonal, which joins any two opposite vertices of a quadrilateral figure. Any rectilineal figure which has more than four sides is called a polygon, and a polygon is said to be equilateral when all its sides are equal, equi-angular when all its angles are equal; and polygons are said to be mutually equilateral when the sides of one are equal to the sides of the other, each to each, and are placed in the same order, that is, when following their perimeters in the same direction, the first side of one is equal to the first side of the other, the second to the second, and so on throughout, in which cases the sides are said to be homologous. The expression mutually equi-angular, applied to polygons, has a similar signification. Polygons are specially named from the number of their sides; and thus we have pentagons, hexagons, &c.

A circle is a plane figure bounded by a curve line, all the portions of which are equally distant from a fixed point called the centre of the circle: any line drawn from that point to the curve line is called a radius of the circle: any line drawn through the centre, and terminating at both ends in the curve line, is a diameter of the circle: and the curve line itself, constituting the boundary of the circle, is called the circumference. It is evident that a circle can have only one centre; that all the radii of the same circle are equal; that a diameter of any circle is equal to two radii of the same circle; and that circles are equal which have the same diameters.

Figures are said to be equal which, when applied to each other, wholly coincide; and to be equivalent, when, though they do not coincide, they nevertheless contain the same space.

A proposition is either an assertion of some distant truth which becomes manifest by demonstration, and is called a theorem, or requires a thing to be done, and is called a problem. A lemma denotes a subsidiary truth, or subordinate property, comprehended in and employed for the demonstration of a theorem. A corollary is an obvious or easily inferred consequence of a proposition. A scholium signifies a remark, of the nature of a commentary, on a preceding proposition, and is employed to point out its connexion, use, and required modification of it. An hypothesis is a supposition, or concession, made in stating a proposition, or during the process of demonstration.

We proceed, after these definitions and explanations, to treat of some of the properties and affections of plain figures; and in doing so as briefly as is consistent with perspicuity, we must suppose the student already acquainted with the modes of drawing sundry lines and figures by means of the rule and compasses. For another reason, very obvious to those who know to what extent even the elements of geometry are generally carried, we must conceive many propositions to be quite obvious to him, and not to require demonstration. Indeed, we are constrained to say, in spite of the offence it may give, that the ostentatious display of demonstration and proof, where no rational creature can possibly desire evidence, is an obstacle to the acquisition of mathematical science, as it often obscures what is plain, but rarely aids the conception of what is difficult.

Prop. 1.—Two triangles are equal in which all the sides of one are equal to all the sides of the other. They are also equal if two sides of one and the contained angle are equal to two sides and the contained angle of the other.

2. If one side of a triangle be produced, the exterior angle will be greater than either of the interior opposite angles. Let A B C (Fig. 3.) be the triangle, and B E the part of the side A B produced. Then the angle C B E will be greater than the angle A C B, or B A C. For let B C be divided into two at the point F, and let the line A F be produced till F G be equal to A F, and join G B. Then as the two triangles A F C and B F G have two sides in the one equal to two sides in the other, namely A F and F C respectively equal to F G and F B, and as the two angles contained by these lines are vertical, and so equal to each other, that is, the angle A F C to the angle B F G, these two triangles must be equal to each other; and so the angle F B G is equal to the angle F C A. But the angle F B E, or, which is the same, C B E, is obviously greater than the angle F B G, and, consequently, greater than the angle F C A, or, which is the same, the angle A C B. But suppose the side C B also produced, then, on the same principle, it can be shewn that the angle A B D, which is equal to the angle C B E, being vertical, is greater than the angle B A C, and so also, therefore, is the angle C B E.

3. The exterior angle of a triangle is equal to both its opposite interior angles; For it can be shewn, in the same figure, that the line B G is parallel to A C, and that, in consequence, the angle G B E is equal to the angle B A C, and the angle C B G is equal to the angle A C B; wherefore the exterior angle C B E, which consists of the angles G B E and C B G, is equal to both the angles A C B and B A C.

4. All the interior angles of a triangle, taken together, are equal to two right angles; for it has been shewn, (same figure,) that the exterior angle C B E of the triangle A B C is equal to both the interior opposite angles, namely A C B and B A C. To these equals add the common or adjacent angle A B C, and then all the angles of the triangle, namely A B C, B C A, C A B, are together equal to the two angles C B E, C B A; but these two angles are equal to two right angles; therefore, all the interior angles of the triangle are equal to two right angles.

Cor. 1.—If two angles in one triangle be equal to two angles in another triangle, the remaining angle of the one shall be equal to the remaining angle of the other. 2. If one angle of a triangle be a right angle, the other two angles, taken together, are equal to a right angle. 3. If one angle of a triangle be greater than a right angle, the other two angles, taken together, are less than a right angle. 4. Any two angles of a triangle, taken together, are less than two right angles. 5. In every triangle the two least angles are acute. 6. Every triangle has two acute angles.

5. The angles at the base of an isosceles triangle are equal; and, if the equal sides be produced, the angles upon the other side of the base, or under the base, are also equal. Let the isosceles triangle be A B C, (Fig. 4.) in which the side A B is equal to A C. Draw A D, so as to bisect the vertical angle B A C, that is, to divide it equally into two parts, which is done by finding the centre point E of the base B C, and letting fall or raising up a perpendicular thereon. Now, as A B is equal to A C, and the line A E is common to the two triangles A B E, A C E, and the angles contained by them, namely, B A E, C A E, are equal, therefore these two triangles are equal; which may also be inferred from the equality of E C to E B, A E being common, and the two angles A E C, A E B, as contained therein, or as being both right angles, being equal. Consequently, the other angle of the triangle A E B, namely, A B E, is equal to the other angle of the triangle A E C, namely A C E. In A B produced, take any point F, and on A C produced take A G equal to A F. Now in the two triangles A C F, A B G, the two sides, A F, A C, are equal to the two sides A G, A B, and they contain the angle F A G, which is common, and therefore the two triangles are equal; the angle A B G is equal to the angle A C F, and the base B G to the base C F. But B F is equal to C G, for A F is equal to A G, and A B is equal to A C. Wherefore in the two triangles, B F C and C G B, we have the two sides, B F, F C, equal to C G, G B, and the side B C is common. Consequently the two triangles are equal; and as angles which are opposite to equal sides are equal, the angle F B C is equal to the angle G C B.

Corol. 1.—Every equilateral triangle is also equiangular. 2. The line which bisects the vertical angle of an isosceles triangle bisects the base, and is perpendicular to it.

6. In any triangle, the greatest angle is opposite to the greatest side; for, in the triangle A B C, Fig. 5. let A B be greater than either A C or B C; and in A B take A D equal to A C, and draw C D. The triangle A D C is isosceles, and the angle A D C is equal to the angle A C D. But the angle A D C is the exterior angle of the triangle B C D, and it is therefore greater than the interior opposite angle C B D. The angle A C D is consequently greater than the angle C B D; and much more, therefore, is the angle A C B greater than the angle C B D.

Cor.—In any triangle the greatest side is opposite to the greatest angle.

7. In every triangle, any two sides taken together are greater than the third. In Fig. 6. let B A be produced to D, so that A D shall be equal to A C, and join D C. The triangle A D C is isosceles, and consequently the angles at its base are equal, that is, the angle A D C to the angle A C D. But the angle B C D is greater than the angle A C D, and consequently greater than A D C; and the greater side is opposite to the greater angle; therefore, the side D B is greater than the side B C. Now D B is equal to B A and A C, and therefore the sides B A, A C, of the triangle A B C, taken together, are greater than B C. In the same way it may be proved, that the sides A B, B C, are greater than C A, and B C C A are greater than A B.

Cor.—It can be proved, in the same manner, that a straight line is the shortest which can be drawn between any two points.

8. Two straight lines, drawn from the extremities of the base to a point within a triangle, are together less than the sides of the triangle, but contain a greater angle. Let the triangle be A B C, (Fig. 7.) let D be the point to which the two straight lines are drawn from the extremities of the base, and produce A D to E. The two sides A B and B E of the triangle A B E, are greater than the third side A E. Let E C be added to each, and A B, B E, E C, or A B and B C, are greater than DE and E C. So also are the two sides C E and E A of the triangle D E C greater than the third side D C; and therefore C E, E D, together with D A, or CE and E A, are greater than C D and D A. Consequently, the sides A B and B C, being greater than A E and E C, which are greater than A D and D C, must much more be greater than A D and D C, that is, the lines A D and D C are less than A B and B C, the sides of the triangle. Farther, the angle A D C is the exterior angle of the triangle D C E, and is therefore greater than the angle D E C; and the angle D E C, which is the exterior angle of the triangle A B E, is greater than the angle A B E. Consequently the angle A D C, which is the angle contained by the two straight lines drawn from the extremities of the base A C, is greater than the angle A B E, that is, A B C.

9. Of all the straight lines which fall from a given point upon a given straight line, that which is perpendicular is the shortest; those which are equidistant from the perpendicular on both sides are equal, and those which are remote are greater than those which are near. Let A B (Fig. 8.) be the given straight line, and C the given point from which the perpendicular falls on D, and the two lines C E and C F, which are at equal distances from the perpendicular, and also the line C G at a greater distance, are drawn to the line A B. It is evident that the triangle C D E is equal to the triangle C D F, for they have each a right angle at D, and the two sides containing it in one equal to the two corresponding sides in the other. Hence, the third side in one, namely, C E, is equal to the third side in the other, namely, C F. But, in a triangle which has one right angle, each of the other two angles must be acute. Therefore, in the triangle C E D, the angle at D must be greater than either of the other two angles, and consequently must have the greater side opposite to it. The line C E, then, must be greater than C D, and C F must be greater than C D. On the same principle, it may be shewn that every other line drawn from C to either side of C D must be greater than C D. Wherefore C D is the shortest line which can be drawn from C to the line A B. But the angle C F G, the exterior angle of the triangle C D F, is greater than the angle C F D, and greater than the angle C D F. Wherefore, as opposite to the greater angle, C G is greater than C F. And, on the same principle, it may be shewn that it is greater than any other line drawn from C nearer to D, and less than

any other line drawn from C to a greater distance from D.

Corol.—There can only be one perpendicular drawn from the same point to a given straight line: and hence, also, there cannot be three equal straight lines greater than the perpendicular drawn from the same point to a given straight line.

10. If two sides of one triangle be equal respectively to two sides of another, but contain a greater angle, the base, or remaining side of the former, shall be greater than the base or remaining side of the latter. In the two triangles A B C and D E F, Figs. 9 and 10, let the sides A B and B C, be equal to D E and E F, and the angle A B C be greater than the angle D E F. If A B be not greater than B C or E F, draw B G equal to E F, and so as to make the angle A B G equal to the angle D E F, also join A G and C G. As A B and B G are equal to D E and E F, and the angle contained by them, namely, A B G, is equal to D E F, the triangles A B G and D E F are equal, and therefore have their basses equal. Now, if the triangles A B C and D E F are isosceles, the angle B A C must be equal to B C A; but the angle B H C is greater than the angle B A H, for it is the exterior angle of the triangle B A H, and it is greater than the angle B C H, which is equal to the angle B A H or B A C; and therefore the side B C or B G is greater than B H, that is, the point G lies beyond H. But if the side B C or E F (See Figs. 11. and 12.) be greater than A B or D E, then the angle B A C is greater than the angle B C A. But the angle B H C, which is the exterior angle of the triangle A B H, is greater than B A H, that is B A C, and still greater than the angle B C A or B C H, and, consequently, the side B C or E F is greater than B H. The point G, then, must always be below the base A C. But as the triangle G B C is isosceles, the angle B G C is equal to the angle B C G. Wherefore the angle A G C, which is greater than B G C or B C G, which again is greater than A C G, must be still greater than A C G, and, consequently, the opposite side A C is greater than A G or D F.

11. If two sides of one triangle be equal respectively to two sides of another triangle, but the base of the former be greater than the base of the latter, the angle contained by the sides of that triangle which has the greater base shall be greater than the angle contained by the sides of the other triangle which are equal to them. Let the two triangles be A B C and D E F, Figs. 13. and 14. in which A B and A C are equal to D E and D F respectively, but in which the base B C is greater than the base E F. Then, if the angle B A C be not greater than the angle E D F, it must be either equal to it or less than it. But it cannot be equal to it; because, in that case, the base B C would be equal to E F, whereas it is greater; and it cannot be less, because then the base B C would be less than E F, which it is not. Consequently the angle B A C is greater than the angle E D F.

12. Two triangles are equal, in which two angles and a corresponding side of one are respectively equal to those in the other. In the two triangles A B C and D E F, Fig. 15. and 16. let the angle B A C be equal to the angle E D F, the angle B C A to the angle E F D, and a side of one equal to a side of the other, as the interjacent side A C to D F. If the triangle A B C be applied to D E F, the point A being laid on D, and the line A C on D F, the other extremities C and F must coincide, because the lines are equal; and then the angle at A being equal to the angle at D, the side A B must lie along D E; and for the same reason, the angle at C being equal to the angle at F, the side C B must lie along F E. Consequently the point B, which is common to the two lines A B and C B will be found also in D E and F E, that is, must correspond with the vertex E; and thus the two triangles will correspond throughout, and therefore be equal. If the equal sides be A B and D E, opposite to the equal angles B C A and E F D, then the triangle A B C being laid on D E F, the sides A B and A C will coincide with D E and D F, the sides of the equal angles E D F; and as A B is equal to D E, the points B and E must coincide. But as the angles B C A and E F D are equal, B C must correspond to E F; for otherwise one of these angles would be greater than the other. Consequently the triangles coincide throughout.

It is properly remarked by Mr Leslie, from whose *Elements of Geometry* this proposition, with its demonstration, is taken, a little altered, that the whole structure of the science is founded on the simple comparison of triangles. He farther remarks, that a single property includes all the different requisites to their equality. " The sides of a triangle are obviously independent of each other, being subject to this condition only, that any one of them shall be less than the remaining two sides. But since all the angles of a triangle are together equal to right angles, the third angle must, in every case, be the necessary result of the other two angles. A triangle has, therefore, only five original and variable parts, the three sides and two of its angles. Any three of these parts being ascertained, the triangle is absolutely determined. Thus, when (1.) all the three sides are given,—when (2.) two sides of an opposite angle are given, with the affection of the triangle, (that is, the character as to being right angled, obtuse or acute),—or when (3.) one side and two angles, and thence the third angle are given, the triangle is completely marked out."

The nature of the demonstration above given is obviously different from that on which we have hitherto proceeded, and has been objected to by some mathematicians. We are not here concerned to support its claims, any more than those of motion, for which Mr Leslie contends, as occasionally simplifying or giving clearness to the truth of some propositions. Our object, at present, is merely to communicate a certain degree of information on any sort of evidence ever admitted in the science. Hereafter, for the same reason, we shall, by every possible means, abridge the demonstrations of the propositions we mean to give, and these propositions we mean to select rather for their comprehensiveness and varied nature, than on account of their connexion, or the relation they may be supposed to bear to the elementary principles of the science.

13. A straight line falling upon or cutting two straight lines, which are parallel to each other, makes the alternate angles equal, the exterior angle equal to the interior opposite one, and the two interior angles on the same side together equal to two right angles; also, straight lines which are parallel to the same straight line, are parallel to each other; also, parallel lines are equi-distant. These propositions, and the converse propositions, namely, that if, when a straight line falling upon two straight lines, makes the alternate angles equal, &c. will be readily admitted, if the idea of parallel lines being such as that when perpendiculars to one of them, any where taken, and terminated by the other, are equal to one another, be clearly comprehended; or if it be conceived that parallel lines are, as it were, the regular expansion in surface of one line. But the strict proof of them, and indeed the subject of parallel lines generally, "is," as Mr Playfair notices, "one of the most difficult in geometry."

14. The opposite sides of a parallelogram are equal, as are also the opposite angles; and the diagonal divides it into two equal parts: The lines A B and D C (Fig. 17.) being parallel, as are also A D and B C, the angle B A C = D C A, and B C A = D A C. Consequently, the equiangular triangles A B C and A D C, which have A C common, are equal.

Cor.—If one angle of a parallelogram be a right angle, all the other angles will be right angles.

15. The lines which join the corresponding extremities of two equal and parallel lines are also equal and parallel. For, as (in the same Fig.) A B and D C are by hypothesis parallel, and the diagonal A C is a right line uniting these two parallel lines, and is common to the two triangles A C D and B A C, the angle B A C = angle A C D; therefore, the remaining sides and angles of the two triangles are equal. Consequently, the side A D = C B, and the angle A C B = C A D; and consequently also A D is parallel to B C.

16. The diagonals of a parallelogram or a rhomboid bisect each other. The sides A B and C D, Fig. 18. are equal and parallel; and so are A C and D B. Therefore, the alternate angle A B C = D C B, and A C B = D B C, and so the triangle A E B = C E D: Consequently A E = E D, and B E = E C.

Cor.—The diagonals of a rectangle are equal to each other. For if the angles at A and B were right angles, the triangles A C B and D B C would be equal, and consequently the base A D = B C.

17. Lines drawn parallel to the sides of an angle contain an equal angle. Let D E (Fig. 19.) be drawn parallel to A B, and D F to A C; and let the line G A meet them. Then the angle G D E = G A B, and G D F = G A C. Consequently, taking away the equals G D E and G A B, there remains E D F = B A C.

18. If from any number of points at equal distances, on one side of a triangle, lines be drawn parallel to the base, so as to meet or cut the other side, the parts of that side so cut shall be equal to each other. Let the triangle be A B C, Fig. 20. and the lines drawn at equal distances from one of the sides, namely A C, be D G, E H, and F I, meeting the side B C in the points G H I. Then the parts G H and H I shall be equal. For make K H L parallel to A C, intersecting D G produced in K, and F I in L; then the triangle G H K and L H I, having the angles G H K = L H I, G K H = I L H, and H K = H L, are equal, and consequently have G H = H I.

Cor.—Two angles which have their sides parallel, each to each, and lying in the same direction are equal.

19. If there be taken four points in the sides of a square, equally distant from the angles, the figure formed by joining those points shall also be a square. Let A B C D, (Fig. 21.) be the square, and the points equally distant from the angles be E F G H. Now the whole sides A D, D C, C B, B A, being equal, and also the parts A E, D F, C G, B H, the remaining parts E D, F C, G B, H A must be equal; but all the angles of the square, namely, at A, B, C, D, are equal, and, consequently, the sides opposite to them will be equal, namely, E H, H G, G F, F E, and the angle A H E = B G H = C F G = D E F. Now, the angle A H G being the exterior angle of the triangle B G H, is equal to both the internal opposite angles, H B G and B G H. Taking away, therefore, the equal angles A H E, B G H, we have E H G = H B G. But the angle H B G is a right angle; therefore E H G is a right angle; and so likewise it may be shewn are the angles at G, F, and E; and it has already been proved, that the sides E H, H G, G F, F E are equal. Wherefore the quadrilateral figure E H G F is both equilateral and equiangular, that is, it is a square.

20. If all the sides of a quadrilateral be bisected, the figure formed by joining the parts of bisection will be a parallelogram. For drawing the diagonals A C and B D in the quadrilateral A B C D, (Fig. 22.) we have H G parallel to A C, and also E F parallel to A C; wherefore H G and E F are parallel; and, for the same reason, so are G F and H E parallel to each other. Consequently, the figure E F G H is a parallelogram.

21. The sum of all the angles round any rectilineal figure is equal to twice as many right angles as the figure has sides, abating four. For, let lines be drawn from the angles to any point in the centre, as to O in the figure A B C D E, (Fig. 23.) Here we have as many triangles as the figure has sides, namely, in this case, five; and the sum of the angles of these is equal to twice as many right angles. But the angles at the bases of these triangles constitute the internal angles of the figure; and from the whole amount of the angles of the triangles, there must be deducted the angles at the common vertex, O, which are equal to four right angles.

Cor.—All the angles of a quadrilateral are equal to four right angles; all those of a five-sided figure are equal to six; those of a six-sided figure to eight, &c.; the amount increasing by two right angles for each additional side.

22. The sum of the exterior angles of any rectilineal figure, is equal to four right angles. For every interior angle A B C, (Fig. 24.) with its adjacent exterior angle A B D is equal to two right angles; therefore, all the interior, together with all the exterior angles of the figure, are equal to twice as

many right angles as there are sides of the figure; that is, they are equal to all the interior angles of the figure, together with four right angles. Consequently, all the exterior angles are equal to four right angles, or, in other words, they are equal to the four right angles which, according to the preceding proposition, were abated from the amount of all the angles of the triangles into which a rectilineal figure can be divided in order to form the sum of the interior angles.

Cor.—If the figure has a re-entrant angle, as B C D, (Fig. 25.) the angle B C K, which occurs in place of an exterior angle, must be deducted from the amount, because the angle B C D must be regarded as exceeding two right angles by the angle B C K.

23. Parallelograms upon the same base, and between the same parallels, are equal to one another; and so are they if upon equal bases and between the same parallels: likewise, triangles upon the same or equal bases, and between the same parallels, are equal. Farther, if a parallelogram and a triangle be upon the same basis and between the same parallels, the parallelogram is double of the triangle: and, lastly, all parallelograms are equal the bases and altitudes of which are equal, as are all triangles; and the former are double of the latter. All these distinct propositions can be demonstrated individually; but the general principle may be very compendiously exhibited. Let the base A B, Fig 26. be common to the triangle A B C and the parallelogram A B E D; let D E, which is admitted to be parallel to the base, be produced to F, so that E F be equal to D C: draw B F, and let C G be the altitude of the triangle ABC and the parallelogram A B E D, that is perpendicular to A B, and, consequently, to D E. As $EF = DC$, and C E is common, $FC = DE$; but $DE = AB$, and consequently $FC = AB$. In the triangles F C B and A C B, therefore, we have $FC = AB$, the angle $ABC = FCB$, and the side B C common. Wherefore these two triangles are equal, and each of them is half of the parallelogram A B F C, for the diagonal C B divides it equally. But the sides A C and B F are parallel, as well as A B and C F, and they are equal. Therefore, in the triangles A D C and B E F we have $EF = DC$, $BF = AC$, and the angle E F B, that is, $DFB = DCA$; and, consequently, these two triangles are similar and equal. Add to both of these equals the common figure A B E C, and you have the parallelogram $ABFC = ABED$. But the parallelogram A B F C is double the triangle A B C; and consequently the parallelogram A B E D is double the triangle A B C, or C B F; and it can be easily shewn that the triangle $EFB = ADC = CEB =$ half of G B E C, &c. Or, in Figs. 27. and 28. Let A B be the common base of the two parallelograms A B C D and A B E F, which have the same altitude, and also their upper sides in the same straight line parallel to A B. Here we have $AD = BC$, and $AF = BE$, also $DC = AB$, and $FE = AB$; and consequently $DC = FE$. So that if D C and F E be taken away from the same line D E, the remainder, C E and D F, will be equal. The triangles D A F and C B E are therefore equilateral and equal; and if from the quadrilateral, A B E D, there be taken away the triangle A D F, there will remain the parallelogram A B E F; and if from the same quadrilateral, A B E D, there be taken away the triangle C B E, which is equal to A D F, there will remain the parallelogram A B C D, which is consequently equal to A B E F.

24. The complements of the parallelograms about the diagonal of a parallelogram are equivalent. For the triangle D C B, Fig. 29, is equal to the triangle D A B; and the parts thereof D I E and E F B are respectively equal to D H E and E G B; consequently the remaining parts A G E H, C I E F, which are the complements of the parallelogram A B C D, are equal.

25. The rectangle contained by two straight lines is equivalent to the sum of all the rectangles contained by one of them, and the several parts into which the other is divided. Let A B C D, Fig. 30. be the rectangle contained by the two whole lines A D and A B, that is, $AD \times AB$; and let H F and G E be parallel to A D, and meet D C in F and E. Then all the rectangles A F, H E, G C have the same altitude as A C. Consequently $AF = AD \times AH$, $HE = AD \times HG$, and $GC = AD \times GB$; and, therefore, $AD \times AB$, that is $AC = AF + HE + GC = AD \times AH + AD \times HG + AD \times GB$.

26. The square described on the sum of two straight lines, or on the whole of a line, is equivalent to the squares of the two lines, or the two parts of the line, together with twice their rectangle. Let A B C D, (Fig. 31.) be the square of the two straight lines A E and E B, taken together, or of the whole line A B; A E F G the square of A E; and let E F be produced to meet one of the sides of the square A B C D in H, and G F be produced to meet another side in I. It is manifest that E H and G I are equal. From these equals take the equals E F and F G, and there will remain the equals F I and F H. Now, all the angles of H F I C are right angles, and its sides are equal; therefore it is a square upon $FI = EB$. Farther, the figures E B I F and D G F H are equal to two rectangles contained by the sides E F and F I, or G F and $FH = AE$ and E B. Consequently, the whole square of A B is equal to, or composed of, the two squares of A E and E B, and twice the rectangles contained by those lines.

Cor.—The square of a line is equal to four times the square of half that line.

27. The difference of the squares of any two unequal lines is equal to a rectangle contained by the sum and the difference of the lines. Let the squares be A B E H and A C I K, (Fig. 32.) In E B produced, take $BF = AC$, draw F G parallel to H E, and produce C I both ways, so as to meet E H in D, and F G in G. It is manifest that D E F G is a rectangle contained under $GF = CB =$ the difference of the two lines A B, A C, and $FE = BA + AC =$ the sum of these two lines. But the rectangle $DEFG = DEBC + CBFG = DEBC + DIKH =$ the square $ABEH -$ the square A C I K.

28. In any right-angled triangle, the square of the side subtending or opposite to the right angle is equal to both the squares described on the sides containing

the angle. Let the triangle be A B C, (Fig. 33.) right-angled at A B C, and the squares described on its sides be A C I K, namely, that of the side subtending the right angle, and the other two B C G H and A B F E; let one of the sides of each of these two be produced, so as to meet each other in L and D, in which take K L and I G, each equal to A E $= AB$, and let C I, I K, and K A be drawn. The lines A H and F C are equal, and so are E L, D G, E D, and L G, and the angles at E, D, G, L are right angles. Consequently E D G L is a square, and so also is A C I K. If, now, from the former the four equal triangles A D C, C G I, I L K, and K E A be taken away, there will remain the square A C K I; and if, from the same, the two equal parallelograms A B C D and B F L H, which are equal to these four triangles, as A B C D is equal to two of them, be taken away, there will remain the two squares A B F E and B C G H. Therefore, the square $ACIK = ABFE + BCGH$.

29. The difference of the squares of the two sides of any triangle is equal to the difference of the squares of the two lines or distances included between the extremes of the base and the perpendicular of the triangle. Let the triangle be A B C, (Fig. 34.) in which all the angles are acute, or A B C, (Fig. 35.) in which one of the angles is obtuse, and draw the perpendicular D C to the base, or the base produced A B from the angle A C B. Now, as $AC^2 = DC^2 + AD^2$, and $BC^2 = DC^2 + BD^2$, it is manifest that the difference of AC^2 and $BC^2 =$ to the difference between $DC^2 + AD^2$, and $DC^2 + BD^2$, or between AD^2 and BD^2, DC^2, as common to both, being taken away.

30. The sum of the squares of two straight lines is equal to twice the squares of half their sum, and of half their difference. Let the two lines be A B and B C, Fig. 36. making together the line A C. Divide A C into two equal parts at the point D, on which erect the perpendicular D E equal to A D or D C; join A E and E C; from B draw B F parallel to D E, and from F draw F G parallel to A C; and, lastly, join A F. Now, the triangle A D E is isosceles, and each of its acute angles, namely, A E D and E A D, is equal to half a right angle, and so also, for the same reason, is each of the angles D E C and E C D; consequently, the angle A E C is equal to a right angle. But in the triangle F B C, the angle $CBF = CDE$ is a right angle, and the angle B C F is half a right angle, as also is the angle B F C, and, consequently, the side $BF = BC$; and in the same way it may be shewn that the triangle E G F is isosceles. Now, therefore, $EF^2 = EG^2 + GF^2 = 2GF^2 = 2DB^2$; and, in the right-angled triangle A D E, we have $AE^2 = AD^2 + DE^2 = 2AD^2$. But A B F is a right-angled triangle, and, therefore, $AF^2 = AB^2 + BF^2 = AB^2 + BC^2$; and so also is A E F; consequently, $AF^2 = AE^2 + EF^2 = 2AD^2 + 2DB^2$. Wherefore, $AB^2 + BC^2 = 2AD^2 + 2DB^2$.

31. The square of the side of a triangle is greater or less than the sum of the squares of the base and the other side, according as the opposite angle is obtuse or acute, by twice the rectangle contained by the base and the distance between the vertex of that angle and the perpendicular. In the case of the obtuse-angled triangle A B C, Fig. 37. where the perpendicular B D falls without the base, the square of A D, that is $\overline{AC + CD}^2 = AC^2 + CD^2 + 2AC \times CD$. Add DB^2 to each side, and then we have $AD^2 + DB^2 = AB^2 = AC^2 + CD^2 + DB^2 + 2AC \times CD$; but $CD^2 + DB^2 = CB^2$; wherefore $AB^2 = AC^2 + CB^2 + 2AC \times CD$; that is, the square of A B exceeds the squares of A C and B C by twice the rectangle under A C and C D. In the acute-angled triangle, again, as A B C, Fig. 38. where the perpendicular B D falls within the triangle, $AB^2 = AC^2 + BC^2 - 2AC \times CD$. For $AD^2 = AC^2 + CD^2 - 2AC \times CD$. Add DB^2 to each, and we have $AD^2 + DB^2 = AB^2 = AC^2 + CD^2 + DB^2\ (= BC^2) - 2AC \times CD$; and, consequently, $AB^2 = AC^2 + BC^2 - 2AC \times CD$.

32. The double of the square of a line drawn from the vertex to the middle of the base of a triangle, together with double of the square of half the base, is equal to the squares of both the sides taken together. Let the triangle be A B C, Fig. 39. and the line drawn from the vertex to the middle of the base be C E; also let C D be perpendicular to A B. Then, as $AC^2 = AE^2 + CE^2 - 2AE \times ED$, (or $2BE \times ED$,) and as BC^2 is less than this sum by the same double rectangle, it is manifest that $AC^2 + BC^2$ must be equal to that sum taken twice.

33. The squares of the sides of a parallelogram, taken together, are equal to the squares of its diagonals. Let A B C D, Fig. 40. be the parallelogram, and its diagonals be A C and B E. The triangles A E B and D E C are equiangular, and have $AB = DC$, as also $AE = CE$, and $BE = DE$. Now, $2AE^2 + 2ED^2 = AD^2 + CD^2$, and, taking the double of these, we have $4AE^2\ (AC^2) + 4ED^2\ (DB^2) = AD^2 + BC^2 + CD^2 + AB^2$.

Definitions relative to a circle.—A straight line is said to touch a circle when it meets, but being produced does not cut the circle; and circles are said to touch another when they meet but do not cut one another; and the point where they meet is called the point of contact. An arch or arc of a circle is any portion of the circumference; and a chord is the straight line which joins the extremities of an arch. A sector is the portion of a circle contained by two radii and the arch between them. A segment of a circle is the figure contained by a straight line and the circumference it cuts off. An angle in a segment is the angle contained by two straight lines drawn from any point in the circumference of the segment to the extremities of the straight line which is the base of the segment; and an angle is said to stand upon the circumference intercepted between the straight lines which contain the angle. Similar segments are those in which the angles are equal. The tangent to a circle is a straight line, which touches the circumference, or meets it in a single point. Circles in the same plane are said to cut one another when they fall partly within and partly without each other. A right lined figure is said to be inscribed in a circle when all its angles are in the periphery of the circle; and a right-lined figure is said to be de-

Figured Space.

scribed about a circle when all its sides touch the circle.

34. Any chord of a circle falls wholly within the circle; and a perpendicular let fall on it from the centre of the circle will divide it into two equal parts. Let A B, Fig. 41. be the chord; draw C A and C B, and from any part E, in the chord A B, let the right line C E F be drawn, so as to meet the circumference in F. The radii C A and C B are equal, and they are therefore on different sides of the perpendicular C D, and C E is less than C F = C A. So that E, taken wherever we please in the line A B, must fall within the circle. Farther, the triangles A C D and B C D have C A = C B, and C D common, and consequently have A D = B D.

Cor.—A line bisecting any chord at right angles passes, or will pass, if produced, through the centre of the circle.

35. Any two chords equally distant from the centre of a circle, are equal to each other. Draw the perpendicular O F and O C (Fig. 42.) to the chords A B and D E, and draw O D and O A. As O F = O C, O A = O D, and the angles at C and F are right angles, D F must be = A C, and D E = 2D F = 2A C = A B.

36. A diameter is the greatest line that can be drawn in a circle, and the line which is nearer the diameter is greater than the line which is farther off; it follows, that any line greater than the diameter, which is drawn from a point within a circle, must cut the circumference: farther, from any point without a circle, not more than two equal straight lines can be drawn to the circumference, namely, one on each side of the diameter; and the point within a circle, from which more than two equal straight lines can be drawn to the circumference, is the centre of the circle. Again, no circle can be made to cut another in more than two points; if two circles cut one another, they cannot have the same centre; and if two circles touch one another internally, they cannot have the same centre: also, if two circles touch each other internally, the straight line which joins their centres being produced shall pass through the point of contact. It is also demonstrable, and easily perceived, that if the distance of the centres of two circles be equal to the sum of the two semi-diameters, the circles will touch each other outwardly; that if the distance be less than the sum of the semidiameters, a part of the one will be contained in the other; but that if the distance be greater than that sum, the two circles will neither touch nor cut each other.

37. The angle at the centre of a circle is double of the angle on the same circle at the circumference. Let B D C, Fig. 43. be the angle at the centre, and B A C the angle at the circumference, and draw the diameter A D E. The angle B D E = B A D + A B D = 2B A E; and C D E = C A E + A C E = 2C A E. Add these together, and we have B D C = 2B A C. If A B were to pass through the centre, B D C = B A C + A C D = 2B A C. And the proof is equally easy if the diameter fall without the angles.

38. The angles in the same segment of a circle are equal. This follows from their being all equal to half of the angle at the centre, on the same base. Hence, too, equal angles at the circumference must stand on equal arcs, as their doubles, or the central angles, being equal, are terminated by equal arcs, and hence also equal angles standing on the same base have their vertices in the same segment.

39. The angle in a semicircle is a right angle; that in a greater segment is acute; and that in a less segment is obtuse. The first part of the proposition is an obvious consequence of the angle at the circumference being half of the angle at the centre on the same base, this latter being, in the case of a semicircle, equal to two right angles; the second part depends on the same principle, only that the segment is less than a semicircle; and so does the third, the segment being greater than a semicircle.

40. The angle made by a tangent to a circle with a chord drawn from the point of contact, is equal to the angle in the alternate segment. Let the tangent be A B, Fig. 44; the angle in the alternate segment be C F D, and C D the chord. Draw the diameter C O E, and join F E. The line C O being perpendicular, the angle O C B is a right angle; and so is C F E, being the angle in a semicircle. But the angle E C D = E F D, both being in the same segment. Taking away these equals, therefore, from the equals E F C and O C B, we have B C D = C F D.

41. If any side of a quadrilateral inscribed in a circle be produced out of the circle, the external angle will be equal to the opposite internal angle.—Let the quadrilateral be A B C D, Fig. 45, the side produced be B C: draw the diameter B F, and join A F and C F. The angle B A F is a right angle, and it is = B C F = E C F, and D A F = D C F; therefore the remaining, which is the opposite internal angle, B A D = the remaining, which is the external angle, E C D.

Cor.—The opposite angles of any quadrilateral inscribed in a circle, are together equal to two right angles. For E C D = B A D; and adding to each B C D, we have E C D + B C D = B A D + B C D. But E C D + B C D equal two right angles, and therefore B A D + B C D equal two right angles. And in the same way it may be shewn that A B C + A D C = two right angles.

42. If in the same diameter two points be taken, equally distant from the centre, and a line be drawn from each to meet two different points in the circumference, the sum of the squares of the two lines drawn towards one point shall be equal to the sum of the squares drawn towards the other point. Let B and C, Fig. 46. be the points in the diameter A D, equally distant from the centre O, and let the two points in the circumference be E and F, to which the lines B E and C E, and B F and C F are respectively drawn. Draw the radius O E and O F. These are lines drawn from the vertices to the middles of the bases of the two triangles B E C and B F C; and therefore $2E\,O^2 + 2B\,O^2 = B\,E^2 + E\,C^2$, and also $2\,F\,O^2 + 2C\,O^2 = C\,F^2 + F\,B^2$. But $2E\,O^2 + 2B\,O^2 = 2F\,O^2 + 2C\,O^2$, for E O = F O, and B O = C O. Consequently, $B\,E^2 + E\,C^2 = C\,F^2 + F\,B^2$.

43. If two lines cut each other within a circle and terminate in the circumference, the rectangle con-

tained under the parts of the one shall be equal to the rectangle contained under the parts of the other. If two lines be drawn from two points in the circumference of a circle, so as to pass and meet without the circle, the rectangle contained under the whole and the external part of the one shall be equal to the rectangle contained under the whole and the external part of the other. If a line be drawn from the centre of a circle to a point in a chord, the square of the line, together with the rectangle contained under the two parts of the chord, shall be equal to a square made upon the radius of the circle. It follows from this, that the square of a line drawn from any point in the base of an isosceles triangle to the opposite angle, together with the rectangle of the parts of the base, is equal to a square made upon one of the equal sides of the triangle.

44. The rectangle under the two sides of a triangle is equal to the rectangle under the perpendicular to the base thereof and the diameter of the circumscribing circle. The rectangle contained under the diagonals of any quadrilateral inscribed within a circle, are equal to both the rectangles contained under the opposite sides of the quadrilateral. These propositions, which are all capable of strict proof, we must take for granted, leaving the demonstrations to exercise the ingenuity of the reader, who will find the principles of them in some of the preceding theorems.

Definitions relative to similar figures, &c.—Similar rectilineal figures are those which have their several angles equal each to each, and the sides about the equal angles proportionals; and two sides of one figure are said to be reciprocally proportional to those of another, when one of the former is to one of the latter as the remaining side of the latter is to the remaining side of the former. When a straight line is cut so that the whole of it is to the greater part as the greater part is to the less, it is said to be cut in extreme and mean ratio. Straight lines are said to be divided similarly when their corresponding parts have the same ratio. The area of a figure is its surface, or the quantity of space which it occupies.

45. If a right line be drawn parallel to the base of a triangle, it will cut off a triangle similar to the triangle, and will divide the sides proportionally. Let the triangle be ABC, Fig. 47. and the line DE be parallel to the base AB. The angle $CDE = CAB$, and $CED = CBA$, and the angle ACB is common: wherefore the triangle DEC is similar to the triangle ABC. Farther, let AE and BD be joined; then it being demonstrable, that triangles and parallelograms of the same altitude are to one another as their bases, we have $CDE : ADE :: CD : DA$, the altitude DE being the same, and also for the same reason $CDE : DEB :: CE : EB$. But the triangles ADE and BDE being equal, these proportions have a common ratio; and so $CD : DA :: CE : EB$. Hence the obvious method of finding a fourth proportional to three lines.

46. If in any right-angled triangle a perpendicular be drawn from the right angle to the opposite side, it will divide the triangle into two right-angled triangles, each of which shall be similar to the triangle, and the perpendicular shall be a mean proportional between the parts of the side on which it falls. Let the triangle be ACB, (same figure,) which has the right angle ACB, and the perpendicular be CF. Then the angle $ACF + CAF =$ a right angle, and $CAF + CBA =$ a right angle, therefore $ACF = CBA$; and, for the same reason, $BCF = CAF$. Consequently the three triangles ABC, ACF, and BCF are equiangular and similar; and by comparing corresponding sides, we shall have $AF : FC :: FC : FB$.

Cor.—It may in like manner be proved, that $AB : AC :: AC : AF$, and that $AB : BC :: BC : BF$. Hence the method of finding the mean proportional between two lines. For, putting the two lines together, as AF and FB, we make one line, as AB, and on this, as a diameter, describe a semicircle, and then from the point F erect a perpendicular to cut the circumference in C, which perpendicular gives the mean proportional required. Hence, too, we can make a square equal to any given parallelogram. For making AF equal to the length of the parallelogram, and FB equal to its breadth, we find CF, the square of which $= AF \times FB$. Farther, it may be shewn that triangles which have a common, or an equal angle, are to each other as the rectangles of the sides which contain that angle; also, that similar triangles are to each other as the squares of their homologous sides; and also, that triangles which have the sides that contain an equal angle reciprocally proportional, are equivalent.

47. Similar polygons may be divided into the same number of similar triangles; and conversely, polygons composed of the same number of similar triangles are similar. Farther, the perimeters of similar polygons are to each other as the homologous sides; their areas as the squares of those sides; and, if three similar figures were constructed on the three sides of a right-angled triangle, the figure on the hypotenuse will be equal to the sum of the other two, seeing these figures are proportional to the squares of their homologous sides, and that the square of the hypotenuse is equal to the sum of the squares of the two other sides.

48. To describe a circle about a given triangle: Let the triangle be ABC, Fig. 48. Bisect any two of its sides AB and BC by two perpendiculars, DF and EF. These will meet each other in F, the centre of the circle required, from which, with the radius AF, BF, or CF, the circle may be described. In the same way, the circumference of a circle may be described through any three given points not situate in the same right line; and also, having the segment of a circle given, we can find the centre of the circle.

49. To inscribe a circle in a given triangle: Bisect any two of the angles, as A and B, Fig. 49. by lines which meet each other in D; and from D draw DE perpendicular to AB; D shall be the centre of the circle required, and DE the radius, as may easily be proved by drawing DG and DF perpendicular to AC and BC; for then the triangles ADE and ADG, which have the two angles AED and DAE respectively equal to AGD and DAG, and the side AD common, are not only equi-angular, but also have $DE = DG$; and, by the same

principle, D E = D F. Consequently, the circle must pass through the points E, F, G, and touch the sides of the triangle in them.

50. In a circle given to inscribe a square, an octagon, a polygon of 16, 32, 64, &c. sides,—draw the two diameters A B and C D, Fig. 50. at right angles to each other, and draw A C, C B, B D, D A, for the sides of the square: bisect the angles A O C, C O B, &c. by the diameters E F and G H, and join A E, E C, C G, &c. which will give the sides of the octagon; then the angles A O E, E O C, C O G, &c. bisected, will, in like manner, give the points to which the thirty-two sided polygons are to be applied, and so on. The demonstration is sufficiently obvious.

51. To inscribe a regular hexagon in a given circle: Let a line be drawn equal to the radius of the circle, from the extreme of the diameter. That line shall be one of the sides of the hexagon, as is shewn in the same figure, where the dotted lines A I, I K, K B represent three of the sides of the hexagon inscribed in the semicircle A D B. From the hexagon may be formed an equilateral triangle within the circle, by simply joining the vertices of the alternate angles.

52. To inscribe a regular pentagon and decagon in a given circle: On the diameter A B, Fig. 51. and from the centre O, erect the perpendicular O C, meeting the circle in O: divide O B in D, so that $OD^2 = BD \times OB$, and draw D C, which will be equal to the side of the pentagon. Or, construct an isosceles triangle having each of its angles at the base double of its vertical angle; and describe in the circle a triangle E C F, equiangular to it; then bisect the angles at the base of this inscribed triangle, namely, C E F and C F E, by lines which cut the circumference at G and H, and join E G, G C, C H, and H F. These four lines, together with the base E F, are the sides of the pentagon; and the distance O D will give the side of the required decagon.

We may describe the pentagon by first forming the decagon, thus: Divide the radius A O, Fig. 52. at the point M, so that $OM^2 = AO \times AM$. Take A B equal to O M, for the side of the decagon, and it will apply ten times to the circumference. Now it can be proved that the triangles O A B, A M B, and B M O are all isosceles; also the angle A M B = 2M O B; but A M B = M A B. Hence the triangle O A B has each of the angles at its base double of the angle at its vertex; and hence the three angles of the triangle are together equal to five times the angle A O B, which consequently is the fifth part of two right angles, or the tenth part of four right angles; and hence the arc A B is the tenth part of the circumference, and the chord A B is the side of the decagon. By joining the alternate corners of this decagon, we obtain the sides of the pentagon, namely A C, C E, E G, G I, I A. Farther, A B being the side of the decagon, and A C the side of the pentagon; let A L be the side of a hexagon to be inscribed: the arc B L will be the fifteenth part of the circumference, and the chord B L the side of the pentedecagon, or polygon of fifteen sides; and the arc C L the thirtieth part of the circumference, and its chord the side of a polygon of thirty sides.

Knowing therefore the mode of inscribing a square, a pentagon, and a hexagon, we have the means of forming a variety of other regular polygons, as by continually bisecting the intercepted arcs, and getting new chords, the inscribed figure will have the number of its sides successively doubled. Thus, the square gives us polygons of 8, 16, 32, 64, &c. sides: the hexagon gives us polygons of 12, 24, 48, 96, &c. sides; the decagon gives us polygons of 20, 40, 80, 160, &c. sides; the excess of the arc of the hexagon above that of the decagon gives the arc of a fifteen-sided figure, from which we may obtain polygons of 30, 60, 120, 240, &c. sides.

The ancient mathematicians knew of no other regular polygons which could be inscribed geometrically in a circle; and accordingly it is remarked by Mr Thomas Simpson, in his Elements of Geometry 1768, " besides the figures constructed in the preceding problem, and those arising from them by continual bisections, as taking the differences, no other regular polygon can be described, from any known method *purely geometrical*, by means of right lines and circles only." But at the commencement of the present century appeared a work by Mr Gauss of Göttingen, in which it was shewn that some other very complex polygons can be described merely by the aid of circles, as of 17, 257, 65537, &c. sides. The principles are purely geometrical but somewhat intricate, and the construction necessarily complicated; on which account, and not being aware of any utility in the speculation, it is thought proper to avoid any farther notice of the subject.

There are only three regular polygons capable by repeated addition of covering a plain surface, namely, the equilateral triangle, the square, and the hexagon. The angles of the first of these are each two-thirds of a right angle, those of the square are right angles, and those of the hexagon are each equal to four-third parts of a right angle. Accordingly, there may be constituted about a point, six equilateral triangles, four squares, and three hexagons. It is demonstrable that no other regular polygons can be so adjusted. The pentagon, for example, has each of its angles equal to six-fifths of a right angle, and would not fill up the whole of a space about a point if applied three times, whereas, if applied four times, it would more than cover the space. And the angle of every polygon which has more than six sides exceeding four third-parts of a right angle, it is evident that three such polygons cannot be constituted about a point. Of the methods of circumscribing polygons, we think it unnecessary to say any thing farther, than that any regular polygon which can be inscribed within can be circumscribed about a circle.

53. The circumference of a circle is greater than the perimeter; that is, the sum of all the sides of any polygon inscribed in, and less than the perimeter of any polygon described about the circle; and hence two polygons may be formed, the one in and the other about the circle, which shall differ less from each other, and, consequently, from the circle itself, than by any assigned magnitude, however small; and hence a magnitude which is greater than any polygon described in, and less than any described about a given circle, must be equal to the circle itself.

54. Every circle is equal to a rectangle contained

under the radius and a right line equal to half the circumference; for it can be shewn that the rectangle is greater than any polygon inscribed in, and less than any polygon described about the circle. Now, this rectangle can be changed into a square by finding a mean proportional between its length and breadth. Consequently, the long agitated and greatly celebrated problem, to square the circle, is reducible to finding the circumference when the radius is given; and this can be effected only by knowing the ratio of the circumference to the radius or the diameter; a question, the solution of which has hitherto been only approximated, but that so nearly as to render all anxiety about perfect accuracy, or a complete demonstration, utterly childish. How near the approximation is to the exact truth may be easily shewn. Let the radius of the circle be 1, and it can be proved that the side of the inscribed square will be $\sqrt{2}$, consequently the surface of the inscribed square 2, and that of the circumscribing square 4; hence, the surface of the inscribed octagon is $= \sqrt{2 \times 4} = 2,8284271$, and that of the circumscribing octagon $= 3,3137085$. From this we obtain the surface of the inscribed polygon of 16 sides $= 3,0614674$, and that of the circumscribed polygon of 16 sides $= 3,1825979$. Prosecuting the same operation, we get the surface or area of an inscribed polygon of 32768 sides $= 3,1415926$, which may fairly be presumed to be equal to the surface of the circle, the radius thereof being 1, as it certainly differs from it by a quantity so exceedingly small as not to be worthy of calculation. Indeed, the four last decimals, namely, 5926, are so nearly 6000, that, in general, it is quite sufficient to reckon the area $= 3,1416$, the radius being 1. Consequently, if D denote the diameter of any circle, the circumference may be expressed with sufficient accuracy by $3,1416 \times D$, and the area by $D^2 \times ,7854$. But if any one chuse to be more precise in his calculations, he will probably be satisfied with the result to which some laborious inquirers have attained, namely, that the radius being 1, the circumference is 3,1415926535897932.

55. *Definitions required in the geometry of planes and solid angles.*—A straight line is perpendicular to a plane when it makes right angles with every straight line meeting it in that plane. One plane is perpendicular to another, when the straight lines drawn in it perpendicularly to the common section of the two planes are perpendicular. Parallel planes are such as are every where equally distant, and do not meet to whatever distance produced. The angle, or mutual inclination of two planes, is the quantity by which they are separated from each other, and the quantity is measured by the angle contained between two perpendiculars drawn in these planes at the point of their common intersection. A solid angle is the angular space included between several planes which meet at the same point. Three planes are required to form a solid angle. Similar solids are such as are bounded by the same number of similar planes similarly situated, and having like inclinations to each other. The reader is supposed to know as much of the different kinds of solid figures, such as the pyramid, the parallelopiped, the cube, the sphere, &c. as enables him to comprehend all the allusions we shall make to them. Some of the most important elementary propositions respecting solid bodies are the following, most of which we must give without demonstration.

56. A straight line cannot be partly in a plane and partly out of it. Two straight lines which intersect each other are in the same plane. If two planes cut one another, their common section is a straight line. If a straight line stand at right angles to each of two straight lines in the point of their intersection, it will also be at right angles to the plane in which these lines are. If one right line meet several other right lines in the same point, and is perpendicular to them all, these lines will all be in the same plane. Two right lines perpendicular to the same plane are parallel to each other. If two straight lines be parallel, and one of them is at right angles to a plane, the other is also at right angles to the same plane. The sections made by a plane cutting two parallel planes are also parallel to each other; and hence parallel lines terminated by the same parallel planes are equal to one another. If any solid which has a rectilinear base, and the planes of the sides of which are parallelograms, be cut by a plane parallel to the base, the section will be equal and similar to the bases; and hence the opposite bases of a prism are equal and similar.

57. In a solid angle formed by three plane angles, the sum of any two of these angles is greater than the third. The sum of the plane angles which compose a solid angle is less than four right angles. If two solids be contained by the same number of equal and similar planes, similarly situated, and if the inclination of any two contiguous planes in the one solid be the same with that of the two equal and similarly situated planes in another, the solids themselves are equal and similar. If a solid be contained by six planes, the opposite planes are similar and equal parallelograms. If a solid parallelopiped be cut by a plane parallel to two of its opposite planes, it will be divided into two solids, which will be to one another as their bases. Solid parallelopipeds which have the same altitude, are to one another as their bases; and it follows, that the two prisms which may be formed by a plane passing through the diagonals of two of the opposite planes of a solid parallelopiped are to one another as their bases. Rectangular parallelopipedons having equal altitudes, are in the same proportion as their bases; and if standing upon equal bases, they are in the same proportion as their altitudes. Likewise, all upright prisms are as their bases when of equal altitude, and as their altitudes when their bases are equal. Similar solid parallelopipedons are to one another in the triplicate ratio, or in the ratio of the cubes of their homologous sides; so are cubes and all similar upright prisms, for both cubes and prisms are in the same triplicate ratio of their altitudes.

58. If a solid supposed to be generated by the revolution of any plane figure about its axis, which does not change its position, be cut by a plane perpendicular to the axis, the section will be a circle, the centre of which will be the point where it meets the axis. Let the plane figure be E B C F, Fig. 53.

the axis E F round which it revolves, so as to generate the solid A B C D, and draw a line from the centre O perpendicular to the axis, and meeting B C in R. Then, as O R always preserves its perpendicularity to the axis, it is always in the plane passing through O perpendicular to that axis; and, consequently, as its length also continues the same, the line R *r r r*, described in that plane by the extreme point R bounding the distance, must be the circumference of a circle having its centre in O. It follows that the bases of cylinders and cones, and all sections of them parallel to the bases, are circles.

The three round bodies.—A cylinder may be conceived to be generated by the revolution of a rectangle, as A B C D, Fig. 54. round its immoveable side A B; and in this movement the sides A D, B C, which continue always perpendicular to A B, describe equal circles, forming the upper and lower bases of the cylinder. Every section made in the cylinder at right angles to the axis, as K L, is not only a circle, but is a circle equal to either of the bases; and the section made along the axis as G H P R is a rectangle double of the generating rectangle. A cone is generated by the revolution of a right-angled triangle round one of the sides containing the right angle. The side A B, Fig. 55. describes the base of the cone, which is a circle; the hypotenuse C B describes the convex surface of the cone; the point C is the vertex; C A the altitude, and C B the side or apothem. In the cone every section parallel to the base, as already mentioned, is a circle; and every section formed along the axis, as C D E, is an isosceles triangle double of the generating triangle. The sphere may be conceived to be generated by the revolution of a semicircle about the immoveable diameter; and, consequently, all the points on its surface are equally distant from the centre. The radius of a sphere, as A O or O B, Fig. 56. is a straight line drawn from the centre O to any point in the surface; the diameter or axis is a line passing through this centre, and terminating at both extremities in the surface, as the line A B, and is therefore equal to two of the radii, all of which are equal. Every section of the sphere made by a plane is a circle; every such section which passes through the centre of the sphere is called a great circle, as A M B L; and every other section not passing through the centre is called a little circle, as E G F H. The pole of a circle of a sphere is a point in the surface equally distant from all the points in the circumference of that circle. A spherical triangle is a portion of the surface of a sphere bounded by three arcs of great circles, and those arcs form the sides of the triangle. Each of them is supposed to be less than a semicircumference; and the planes which they form with each other are the angles of the triangle. The terms right-angled, isoscecles, and equilateral, are used in regard to such triangles, as in similar cases of rectilineal triangles. A spherical polygon is a portion of the surface of the sphere terminated by several arcs of great circles. A spherical segment is a portion of the solid sphere included between two parallel planes forming its bases. A plane is said to be a tangent to a sphere when the surfaces of the plane and the sphere have only one point in common. These solid figures, the cylinder, the cone, and the sphere, are the three round bodies treated of in the Elements of Geometry. Some of the most generally useful propositions concerning them are the following.

59. Every cylinder is equal to a rectangular parallelopipedon of equal base and altitude. The solidity of a cylinder is equal to the product of its base by its altitude. The convex surface of a cylinder is greater than the convex surface of any inscribed prism, and less than the convex surface of any circumscribed prism. The convex surface of the cylinder is equal to the circumference of its base multiplied by its altitude.

60. The solidity of a cone is equal to the product of its base by the third of its altitude; from which it follows, that a cone is the third of a cylinder of the same base and altitude. The convex surface of a cone is equal to the circumference of its base multiplied by half its side.

61. The surface of a sphere is equal to its diameter multiplied by the circumference of a great circle of the sphere; and it follows from this, that the surface of a sphere is four times that of its great circle. Farther, the surfaces of spheres are as the squares of their radii; and these surfaces multiplied by the squares of the radii are as the cubes of the radii: hence the solidities of spheres are as the cubes of their radii, or the cubes of their diameters. The surface of a sphere is to the whole surface of the circumscribed cylinder, (including its bases,) as 2 is to 3; and hence the solidities of these two bodies are in the same ratio. Thus, then, a sphere is two-thirds of its circumscribing cylinder, or a cylinder of equal diameter and altitude; and consequently a cone, the half of a sphere or hemisphere, and a cylinder, all of the same altitude, and standing upon equal bases, are in proportion as the numbers 1, 2, 3, respectively.

Polyedrons.—The term polyedron, or solid polyedron, as restricted to regular bodies, is applied to every solid which has equal regular polygons for its faces, and all its solid angles equal. There are only five bodies which possess the properties comprehended in this brief definition; for the conditions required in the construction of a regular polyedron can be fulfilled in a small number of cases only.

In the first place, if the faces are equilateral triangles, we get a polyedron having solid angles contained by three of those triangles, namely the tetraedron, which has four faces; a polyedron having solid angles contained by four of these triangles, namely, the octaedron which has eight faces; and that by five, namely the *icosaedron*, which has twenty sides; besides which three, no other can be formed with equilateral triangles, for six angles of such a triangle are equal to four right angles, and cannot form a solid angle. Secondly, Their faces may be squares, in which case their angles may be arranged by threes; and thus we have the cube or *hexaedron*, consisting of six faces. But no other can be so formed out of squares, as four angles of a square are equal to four right angles, and cannot form a solid angle. Thirdly, If the faces are regular pentagons, the angles may be arranged by threes; and then we have the regular dodecaedron, consisting of twelve faces.

A regular polyedron may be divided into as many regular pyramids as it has faces; and the common vertex of these will be the centre of the polyedron, and also of the inscribed and the circumscribed sphere. The solidity of a regular polyedron is equal to its surface multiplied by a third part of the radius of the inscribed sphere. The radii of the inscribed or circumscribed sphere are to each other as the sides of the polyedrons.

Trigonometry is that part of geometry which treats of the relations of the sides and angles of triangles, and is either *plane* or *spherical*,—the former being restricted to the triangles formed by right lines,—and the latter concerning those triangles which are constituted by arcs of circles. In rectilineal or plane triangles, if three of the six parts which compose them be given, one of these always being a side, we can determine the rest. The necessity for one of them being a side depends on this obvious principle, that triangles may be similar though the length of their sides be very different from each other. In spherical triangles, it is sufficient to have any three of the six parts, whether angles or sides, because in them our object is to determine, not the absolute magnitude of the sides, but their relation to the quadrant, or the number of degrees contained by them.

62. An angle at the centre of a circle is to four right angles as the arch on which it stands is to the whole circumference; and hence, equal angles at the centre of different circles, stand on arches which have the same ratio to their circumference. For if a circle be drawn about the point C, (Fig. 57.) cutting the two sides of the angle A C B, A C be produced to D, and H L be drawn perpendicular to A C at C; the angle A C B will be to a right angle as the arch A B to the arch A H. Therefore, quadrupling the consequents, we have A C B : 4 right angles : : A B : 4 A H, that is to the whole circumference. Again, draw the concentric circle E G K M, then A B : to the whole circumference of the circle A H D L : : E F : to the whole circumference of the circle E G K M.

The arch of the circumference, as A B, intercepted between the sides of an angle formed at the centre of a circle, is called the measure of the angle, namely, A C B. If the circumference be divided into 360 equal parts, each of these is reckoned a degree; and a degree may be divided into 60 equal parts called minutes, each of these into 60 equal parts called seconds, and so on. An angle is said to be of as many degrees, &c. as there are degrees, &c. in the arch by which it is measured. Any arch is to the whole circumference of which it is a part as the number of degrees, &c. in it is to the number 360: and any angle is to four right angles as the number of degrees, &c. in the arch which measures it is to 360. Hence, arches measuring the same angles contain the same number of degrees, whatever may be the radii of the circles to which they belong. A right angle contains 90 degrees; two right angles 180 degrees; half a right angle 45 degrees; and each of the angles of an equilateral triangle 60 degrees. The two diameters A D and H L, which cut each other at right angles, divide the circumference into four equal arches called quadrants. The right line A T touching the diameter A D at A, and produced till it meets the radius C B, also produced at T, is the tangent of the arch A B, or the angle A C B, and C T is the secant of the same. The line B E, which is drawn from the point B, the end of the arch A B, perpendicular to the diameter passing through the beginning of the arch, is the *sine* or *right sine* of the arch, and A E is the *versed sine.* The sine, tangent, and secant of the complement of any angle are called the *co-sine*, as B G or E C, *co-tangent*, H T, and *co-secant*, as CH, of that angle, as when it is less than a right angle they are respectively equal to the sine, tangent, and secant of its complement, that is, of the difference between it and a right angle. The radius is a mean proportional between the tangent and co-tangent of an angle; and it is also a mean proportional between the co-sine and secant.

The chord of 60 degrees is radius; the sine of 90 degrees is equal to the radius: the secant of 0 (that is, of the beginning of the arch or circle) is radius, and so is the co-sine of 0. The versed sine of 90 degrees is radius, and the versed sine of 180 degrees is the diameter. The sine increases from 0 during the first quadrant till it becomes radius; and then it decreases till it becomes nothing. After this it lies on the contrary side of the diameter; and consequently if reckoned positive, before it is negative now. The co-sine, which is equal to radius, when the arch is 0, decreases for the first quadrant, at the end of which it is nothing, so that it also may be said to become negative. The tangent at the beginning is nothing; but it increases beyond all assignable limits during the first quadrant, at the end of which it is infinite. In the second quadrant it is negative, and during this quadrant decreases from an infinite negative to nothing: in the third it becomes affirmative, and increases to infinity, &c. The secant, equal to radius when the arch is nothing, increases during the first quadrant beyond any assignable limit, becomes negative in the second quadrant, &c. From these few remarks, it will be seen how importantly useful the algebraic signs may become when applied to this part of geometry.

63. In a right-angled plane triangle, as the hypotenuse is to either of the sides, so is the radius to the sine of the angle opposite to that side; and as either of the sides is to the other, so is the radius to the tangent of the angle opposite to that side. The sides of a plane triangle are to one another as the sines of the opposite angles. The sum of the sines of any two arches, is to the difference of their sines as the tangent of half the sum of the arches to the tangent of half their difference. The sum of the sides of any plane triangle is to their difference as the tangent of half the sum of the angles at the base of the triangle to the tangent of half their difference. In a plane triangle, if the perpendicular drawn to the base from the opposite angle fall within the triangle, the base is to the sum of the sides as the difference of the sides to the difference of the segments of the base; but if the perpendicular fall

without the triangle, the base is to the sum of the sides as the difference of the sides to the sum of the segments of the base.

These propositions present the formulae for the solution of some of the most frequently occurring questions in plane trigonometry. We shall comprise all we mean to say of spherical trigonometry in a single proposition, of most extensive utility.

64. The co-sine of an angle is equal to the square of the radius multiplied by the co-sine of the opposite side, *minus* the product of the radius by the co-sines of the adjacent sides, the whole divided by the product of the sines of those sides. This proposition, applied successively to the three angles, affords equations, by which all the questions in spherical trigonometry may be solved. The general problem, as already stated, is to determine three out of six quantities, namely, the angles, which we may call A, B, C, and the sides *a*, *b*, *c*. Now six quantities combined four by four, or two by two, give $\frac{6 \times 5}{1 \times 2}$ or 15 combinations; and consequently there are as many equations to form; but, attending only to such as differ essentially, these may be reduced to four. To all of these, we may apply the general formula, as thus expressed in regard to the three angles;—

$$\text{Cos. C} = \frac{\text{Rad.}^2 \times \text{cos.}\, c - \text{Rad.} \times \text{cos.}\, a \ \text{cos.}\, b}{\text{sin.}\, a \ \text{sin.}\, b.};$$

$$\text{Cos. B} = \frac{\text{Rad.}^2 \times b - \text{Rad.} \times \text{cos.}\, a \ \text{cos.}\, c}{\text{sin.}\, a \ \text{sin.}\, c};$$

$$\text{Cos. A} = \frac{\text{Rad.}^2 \times \text{cos.}\, a - \text{Rad.} \times \text{cos.}\, b \ \text{cos.}\, c}{\text{sin.}\, b, \ \text{sin.}\, c.};$$

by operating on which, according to the algebraic rules formerly delivered, we may determine the parts sought from those given. The tables of sines, tangents, &c. usually given in works on logarithms are found of immense utility in solving trigonometrical problems, and consequently in astronomy, navigation, dialling, surveying, and some other important branches of mixed mathematics.

Lines of the second order.—One straight line can touch another straight line in one point only, and hence straight lines in all their variety of relations may be said to be of the first order. But a straight line, if produced, may touch or cut some curve lines in two points, and, accordingly, the term *lines of the second order* has been applied to such as are capable of a double intersection by a straight line. They are, next to the circle, the most simple kind of curves, and have generally, from an early period, obtained the name of conic sections, from the circumstance of their being exhibited in certain sections of a cone by a plane surface. They are three in number, viz. the parabola, the ellipse, and the hyperbola. It will be convenient to consider them as generated by the motion of a point or points, according to peculiar conditions, the nature of which will serve briefly to characterize the three species.

In the straight line A B, Fig. 58. let F be a given point, and let the straight line C E be also given in position, so that A B, if produced beyond A, would be at right angles to it. If, now, a point D move on the same plane, so that its distance from E, namely D E, shall be always to its distance from C E in the constant ratio of two given lines, suppose X and Y, or if the line D E move parallel to A B, so as always to intersect F D, revolving about F, in that ratio, it will describe a line of the second order, and that line will be equally bent on the two sides of A B, so as to constitute one uniform curve, divided by the perpendicular C F, which forms its axis. The curve must cross that perpendicular once, between C and F, the line C F being divisible at A in any given ratio. But if X = Y, the curve will not meet C F again, but stretch out unlimitedly; for no other part in C F, however produced on either side, can be equally distant from C and F. The curve thus generated is the parabola. But if X be less than Y, as in Fig. 59. the curve will again cross the perpendicular, namely, on the right hand at *a*, or, in other words, will return into itself; and this constitutes the ellipse. Lastly, if X be greater than Y, as in Fig. 60. the curve will re-appear on the left hand of C F at *a*, or, in other words, spread both ways, so as to form two opposite diverging branches of indefinite extent. In all of these cases, the given point F is called the *focus*, A is the *vertex*, D E the *directrix*, A B the *axis*; the line D W, Fig. 58. which is parallel to the axis, is a *diameter*; the line D N, drawn perdendicular to A B, is an *ordinate* to the axis, and A N an *abscissa*. Four times the distance, D F, is called the *latus rectum*, or *parameter*, to the diameter D W; and the latus rectum to the axis is called the principal latus rectum. The given ratio of the distances of the describing point from the focus and from the line D E, is called the *determining ratio*; and when this, as already mentioned, is a ratio of equality, the curve is a parabola; when it is a ratio of minority, the curve is an ellipse; and when it is a ratio of majority, the curve is an hyperbola. The middle point between the vertices is the centre of the curve, and the distance of the focus from the centre is its eccentricity.

We shall now enumerate some of the chief properties of the three lines of the second order.

65. In the parabola.—The distance of any point of the curve from the focus is equal to the sum of the abscissa belonging to that point, and the distance of the vertex from the focus, which distance is equal to one-fourth of the principal latus rectum. The square of any ordinate to the axis is equal to the product of the abscissa by the principal latus rectum. The square of the ordinate to any diameter is equal to its parameter multiplied into the abscissa. A perpendicular from the focus to a tangent at any point, is a mean proportional between the distance of that point from the focus and the distance of the vertex from the focus.

66. In the ellipse.—The sum of two right lines drawn from the foci to any point of the curve is equal to the *major axis*, A B, Fig. 59. that is, the straight line which passes through the foci, and terminates at both extremities in the curve. A line drawn from either of the foci F or I to the extremity of the *axis minor* D N, that is, a line drawn at right angles to the middle point, O, of the major axis, and terminated at both extremities in a curve, is equal to the semi-

axis major A O or O B. The latus rectum is a third proportional to the axis major and the axis minor. The rectangle contained by the perpendiculars from the foci upon a tangent is equal to the square of the semi-axis minor; that is, F R × I P = D O².

67. In the hyperbola.—The difference of two lines drawn from the foci F and H, Fig. 60. to any point, G, of the curve, is equal to the major axis A M. The rectangle under the distances of either of the foci from the two vertices, that is, F M × F A, is equal to the square of the semi-axis minor, that is, P O², P A being equal to F O, as O P is to O Q. The latus rectum is a third proportional to the axis major and axis minor. Two perpendiculars, as H S and F T, drawn from the foci to a tangent W V, will meet it in the periphery of a circle described on the major axis as a diameter; and the rectangle under these perpendiculars is equal to the square of the semi-axis minor.

There are various other curves of a higher order, occasionally found useful in geometry, as the conchoid, said to have been invented by Nicomedes, for the purpose of aiding in the celebrated problem of duplicating the cube, and trisecting an angle; the cissoid of Diocles, used for a similar purpose; the quadratic, proposed by Dinostrates, for the subdivision of angles and the squaring of a circle; the logarithmic curve, found to be remarkably useful in certain departments of physical science, especially in exhibiting the relations of elastic fluids; the cycloid, one of the most beautiful and important topics in modern geometry; the epicycloid; the parabolic and hyperbolic curves; the catenary, the properties of which are known to be so serviceable in the theory of bridges, especially those of suspension, one of the greatest improvements of recent times; the magnetic curve; curve of tangents, &c.—of which we conceive it unnecessary to treat particularly in this elementary essay.

Algebra and Higher Geometry.—The properties of the conic sections, stated algebraically, especially those relating to the parabola and the ellipsis, are important formulæ in physical science; and as it is in its application to the geometry of curves that the immense value of the analytic art is so conspicuous, it is proper to make some brief remarks on the subject.

Supposing, then, the curve lines of which we treat to be in a plane, and to be produced therein by the motion of the extremities of one straight line, which, at the same time, moves along another straight line, we can define them by equations involving those quantities the relations of which are conceived to be essential to their characters. Let the straight line, the extremity of which describes the curve, and which is called the ordinate, be expressed by y, and that portion of the straight line on which it moves simultaneously, and which is called the abscissa, viz. between the vertex and the ordinate, be expressed by x. These two together are the *coordinates* of the curve, and are the variable quantities which enter into the equation, consisting besides them of known or given quantities, from the relations of which these variables are determined. In other words, the ratio which exists between the abscissa and the ordinate gives the equation of the curve. The dimensions of such equations are estimated from the highest sum of the exponents of x and y in any term; and the kinds of curves are determined by these dimensions. Thus, straight lines, conceiving them to be so expressed, give simple equations; those of the conic sections, of which, as we have seen, there are four, including the circle, give quadratics, and are therefore said to be of the second order; of the third order there are seventy-eight species; and those of higher order are too numerous to be particularly mentioned. It is obvious that an equation of the kind, involving two variable quantities, must determine every point of the curve, whether that curve return into itself or extend *ad infinitum*; and it is no less obvious, that the varieties of which equations are susceptible are so great as to comprehend all the general affections of curves. The figure of the curve may be found by the particular value of the abscissa, considered in relation to corresponding values of the ordinate, as thereby so many points of the curve are determined; and if numeral values be substituted for them, and also certain numbers for the letters, denoting the known quantities which enter into the equations with them, the resolution of the equations gives numeral expressions for the ordinate and abscissæ, and, in consequence, a description of the curve which may answer all the purposes required. Some of the most general rules on the subject, deducible from observation, are these: When the value of y vanishes, the curve meets the base in a point determined by that of x; and, therefore, if we put $y = o$, the roots of the equation being in this case values of x, give the position on the base at which it is met by the curve. If y become infinite at a particular value of x, the curve has an infinite arc, and the ordinate is thus said to become an *asymptote*, that is, a right line, which though it continually approach the curve so as to arrive nearer to it than any assignable quantity, never meets it. If, on the other hand, y vanishes when x becomes infinitely great, the base becomes asymptotical. If any value of y is impossible, then so many intersections of the ordinate and curve vanish; and if all the values of y become impossible at a particular value of x, the ordinate does not in that situation meet the curve.

In the circle, the properties of which, it is obvious, may be expressed algebraically, the diameter being denoted by a, we have $y^2 = x(2a - x) = 2ax - x^2$, and consequently y itself $= \pm \sqrt{2ax - x^2}$; so that when $x = o$, we have $y = o$. If $x = 1$, then $y = \pm 3$; if $x = 2$, y becomes $= 4$, &c. or the corresponding values of x and y are

$x = o,\quad 1,\quad 2,\quad 3,\quad 4,\quad 5,$
$y = o,\ \pm 3,\ \pm 4,\ \pm \sqrt{21},\ \pm \sqrt{24},\ \pm \sqrt{5},$
$6,\quad 7,\quad 8,\quad 9,\quad 10,$
$\pm \sqrt{24},\ \pm \sqrt{21},\ \pm 4,\ \pm 3,\ \pm o;$

so that the values of y increase from o to 5, and then decrease to zero in the same proportion. The equation $y^2 = 2ax - x^2$ gives $x : y :: y : 2a - x$,—a well known property of the circle.

In the parabola, p being the perimeter or latus rectum of the axis, we have $y^2 = px$, which gives

$x : y : : y : p$, so that we can always determine p by finding a third proportional between any abscissa and its corresponding ordinate: or if, Fig. 58. $AN = x$, $ND = y$, and $AF = a$; then $FN^2 + ND^2 = (FD^2 = ED^2) = CN^2$, or $\overline{x-a}|^2 + y^2 = \overline{x+a}|^2$; that is, $x^2 - 2ax + a^2 + y^2 = x^2 + 2ax + a^2$, or $y^2 = 4ax$.

In the ellipse, calling D N, Fig. 59, $= 2b$, and when $y = b$, and $x = a$, we have $y^2 = \frac{b^2}{a^2}(2ax - x^2)$, which gives $y^2 : 2ax - x^2 : : b^2 : a^2$; that is, the squares of the ordinates of the transverse axis are to the products of their corresponding abscissæ as the square of the conjugate axis is to the square of the transverse axis.

In the hyperbola, we have $y^2 = \frac{b^2}{a^2}(2ax + x^2)$ which gives $y^2 : 2ax + x^2 : b^2 : a^2$; that is, the squares of the ordinates of the transverse axis are to the rectangles of their abscissa as the square of the conjugate axis to the square of the transverse axis.

Infinitesimal Calculus.—The application of algebra to the geometry of curves, leads necessarily and easily to the employment of the same agent in the expression and reasoning concerning the relations of variable quantity in general. Curve lines, it has been shewn, may be conceived to be generated by the motions of points, and the results of these motions can be fully described in the language of the analytical art; so that it is possible, without the aid of diagrams, to state and compare them in every way that may be found requisite, in the prosecution either of the higher geometry itself, or of those branches of science to which it is subservient. By extending the original ideas founded on the variations of the ordinates and abscissas of curves, the generation of magnitude of every kind may be imagined to be effected by the continual motion of some of its parts or boundaries. Thus a line may be supposed to be produced by the motion of a point, a surface by the motion of a line, and a solid by the motion of a surface; and the motion by which these are effected, may be either uniform or variable in different ways. To Descartes is due the merit of having suggested the application of algebra to the geometry of curves, and, in consequence, its application to express the relations of variable quantities. By considering the variable quantities in one state of an equation, as differing infinitely little from the corresponding quantities in another state of the same equation, he may be said to have laid the basis of that admirable calculus, variously denominated the *fluctionary, differential,* or, perhaps, more correctly speaking, *infinitesimal,* the honour of discovering and establishing which was long, and with no small keenness of spirit, claimed by their respective admirers for Newton and Leibnitz. These illustrious rivals both perceived, as Descartes had before them, that the minute variations of the ordinate and abscissa of a curve were intimately connected with properties of the curve which had only a slight dependence on the ordinate and abscissa themselves; and, accordingly, they concluded, that an equation which expressed the relations of these variations would furnish a ready mode of obtaining a knowledge of the properties in question. It was also remarked by them, that an equation of this sort, if deduced from the general equation concerning the curve, assumed a very simple form, and could be easily resolved. But it was obvious, that, to render this deduction distinct, some additional symbols were required. So far these two masters agreed. It is no way surprising, that, without concert or communication, they should henceforward adopt measures for the prosecution of their common principles in which resemblance was not so apparent. The statement respecting the difference between their systems and the nature of the application which may be made of them given by the late Mr Playfair, in his Historical Dissertation affixed to the Supplement to the Encyclopaedia Britannica, is at once so concise and so satisfactory as to preclude the possibility of doing justice to the subject, at least in a small compass, otherwise than by quotation: "Leibnitz, considering the differences of the variable quantities as infinitely small, conceived that he might reject the higher powers of those differences without any sensible error; so that none of those powers but the first remained in the differential equations finally obtained. The rejection, however, of the higher powers of the differentials was liable to objection, for it had the appearance of being only an approximation, and did not come up to the perfect measure of geometrical precision. The analysis, thus constituted, necessarily divided itself into two problems; the first is, having given an equation involving two or more variable quantities, to find the equation expressing the relation of the differentials, or infinitely small variations of those quantities: the second is the converse of this; having given an equation involving two or more variable quantities and their differentials, to exterminate the differentials, and so to exhibit the variable quantities in a finite state. This last process is called *integration* in the language of the differential calculus, and the finite equation obtained is called *the integral* of the given differential equation. Newton proceeded in some respects differently, and so as to preserve his calculus from the imputation of neglecting or throwing away any thing merely because it was small. Instead of the actual increments of the flowing or variable quantities, he introduced what he called the fluxions of those quantities,—meaning by fluxions, quantities which had to one another the same ratio which the increments had in their ultimate or evanescent state. He did not reject quantities, therefore, merely because they were so small that he *might* do so without committing any sensible error, but because he *must* reject them, in order to commit no error whatsoever. Fluxions were, with him, nothing else than measures of the velocities with which variable or flowing quantities were supposed to be generated; and they might be of any magnitude, providing they were in the ratio of those velocities, or, which is the same, in the ratio of the nascent or evanescent increments. The fluxions, therefore, and the flowing quantities or fluents of Newton, correspond to the differentials and the sums or integrals of Leibnitz; and though the symbols which denote fluxions are different from those used to express differentials, they answer precisely the same purpose. The fluxionary and differential calculus may therefore be considered as two modifications of one general method, aptly distinguished by the name of the *infinitesimal analysis*."

A single sentence will explain the general views which Newton entertained on the subject. "I consider mathematical quantities in this place," says he, "not as consisting of small parts, but as described by a continued motion. Lines are described, and thereby generated, not by the apposition of parts, but by the continued motion of points, superficies by the motion of lines, &c." By fluxions, then, according to him, we may understand the arithmetic of the exceedingly small increments or decrements of indeterminate or variable quantities, considered in relation to one another. And, accordingly, in this branch of analysis, as well as in the differential calculus, quantities are distinguished into constant and variable; the former being such as always retain the same value; the latter such as either increase or decrease, and which, in passing from one magnitude to another, pass through all the intermediate states. Constant quantities are here usually designated by the first letters of the alphabet, as variable quantities are by the last; and the fluxions or increments and decrements of the variable quantities are expressed by points or pricks set over them. Farther, as these fluxions themselves may be also indeterminate and variable, the velocities with which these either increase or decrease are considered as second fluxions, and represented by two points over their respective characters; as the perpetual augmentation or diminution of these again give rise to third, fourth, fifth, &c. fluxions, denoted by a corresponding number of points. Thus, the infinitely small increase received by the variable quantity x is represented by $\dot{x}$, that of y by $\dot{y}$, called the fluxions of x and y,—as $\ddot{x}$, $\dddot{x}$, $\ddot{y}$, $\dddot{y}$ are their second and third fluxions. The two chief problems in this branch of analysis, are, 1. From the flowing quantities to find the fluxions; and, 2. From the fluxions to find the flowing quantities.

Confining ourselves entirely to algebraic quantities, or, more correctly speaking, quantities expressed algebraically, we may state the principal propositions and rules of the direct method of fluxions to be the following: 1. To express the fluxions of simple variable quantities, we use the letters which denote them, placing small points over their heads, as the fluxion of $x + y + z$ is simply $\dot{x} + \dot{y} + \dot{z}$; and, in the case of a simple equation, such as $y = ax$, supposing x to receive an infinitely small increment, denoted by $\dot{x}$, y will also receive an increment, as $\dot{y}$, and we have, therefore, $\dot{y} = a\dot{x}$, the fluxion of the equation, in which a, as a constant quantity, undergoes no change. In like manner, therefore, the fluxion of $b + y = ax \pm c$, would give the same result, constant quantities having no fluxions. 2. To obtain the fluxion of two or more variable quantities; multiply the fluxion of each simple quantity by the factors of the products, and connect the last products by their proper signs. Example.—The fluxion of xy is $\dot{x}y + x\dot{y}$, and that of xyz is $xy\dot{z} + x\dot{y}z + \dot{x}yz$. 3. To obtain the fluxion of a variable quantity raised to any power, we diminish its exponent by unity, and multiply the result by its original exponent and by its fluxion. Hence, generally, the fluxion of $y = x^m$ is $\dot{y} = mx^{m-1}x$. 4. To find the fluxion of the product of any number of variable quantities, find the fluxions of one only at a time, as if all the rest were invariable. Proceed in the same way with the rest. And, lastly, collect all these fluxions together. Thus, in the case of x^3y, considering y only to vary, we get $x^3\dot{y}$; and considering x only to vary, we get $3yx^2\dot{x}$; and collecting these together, we obtain for the whole fluxions $x^3\dot{y} + 3yx^2\dot{x}$. 5. To find the fluxion of a fraction containing variable quantities, we multiply the denominator by the fluxion of the numerator; then multiply the numerator by the fluxion of the denominator; lastly, subtract the latter from the former, and divide the remainder by the square of the denominator. Thus, the fluxion of $\frac{x}{y}$ is $\frac{\dot{x}y - x\dot{y}}{y^2}$; that of $\frac{a}{x}$ is $\frac{-\dot{x}a}{x^2}$, a having no fluxion; and that of $\frac{1}{x}$ or x^{-1} is $\frac{-\dot{x}}{x^2}$. 6. To find the fluxion of any radical of the m^{th} degree, we divide the fluxion of the quantity below the radical sign by the exponent m, and by the m^{th} root of this quantity raised to the power $m - 1$. Thus, the fluxion of $x = \sqrt[m]{(az + z^2)}$, which may be written thus, $(az + z^2)^{\frac{1}{m}}$ is $\dot{x} = \frac{\dot{z}\,(a + 2z)}{m\sqrt[m]{(az + z^{2m-1}}}$.

Similar rules may be applied to second, third, &c. fluxions; but sundry ways of simplifying the operations are adopted, which we need not specify in this place.

In the inverse method of fluxions, or that of finding the fluents, or, as it may also be called, *integration*, and which is usually more difficult than the direct, we have three very general rules to guide us where perfect integration is practicable; viz. 1st, Take the fluxionary letter or letters out of the equations; 2d, Augment the indices of the fluxions by unity; and, 3d, Divide the fluxions by the indices of their powers so augmented by unity. In many cases, integration is impossible, because the fluxional expressions have not been produced by taking the fluxions of any quantities; and in others we can have only an approximate integration by means of series, as in the fluxions of logarithms, circular arcs, and certain exponents. But many mathematicians, especially among the followers of Newton, have had recourse to approximation where it is possible to integrate.

The differential calculus, as already observed, agrees intimately with the fluxionary; and there are but few particulars, and these not essential, in which they differ. In the method of fluxions, magnitudes are conceived to be generated by motion; and it is by comparing the increments thus made in equal successive portions of time that it is determined whether the motion be uniform, accelerated, or retarded. If the former be the case, the fluxion of the magnitude is measured by the increment acquired in a given time. Where the motion is accelerated, the increment may be resolved into two parts, that which would be generated if the motion were not accelerated but continued uniform throughout, and that which is generated in consequence of the continual acceleration of the motion during the time. Rejecting the latter, we retain the former as the measure of the motion at the beginning of the time. So, in the case of retarded motion, the quantity found defective in consequence of the retardation is supplied; so that the motion at any proposed term is accurately measured, and the ratio of the fluxions is thus always accurately represented. In the differential calculus, on the other hand, the elements of increase or decrease are supposed to be infinitely small, and are expressed by terms, some of which, conceived to be infinitely less than the rest, are neglected, leaving the others to represent the differences of the proposed quantities. Now, the terms thus neglected as of no importance are precisely the same as those which are conceived, in the method of fluxions, to arise from the acceleration or the retardation of the generating motion, during the infinitely small time in which the element is generated. It obviously follows, that the *differences* in the one case are quite in the same ratio as the generating motions or fluxes in the other; hence, that the conclusions are equally accurate in both, and that there prevails a greater degree of harmony between the two methods than the prejudiced admirers of either, especially the sticklers for the rigid principles of geometry, are very willing to allow.

Among the most interesting, and, in several respects, the most important, problems investigated in mathematical science, are those which relate to what are called the *maxima* and *minima*, or the greatest and least values of variable quantities; and for these due provision is made in the analysis of modern times. When any *function*, understanding thereby an algebraic expression containing one or more variable quantities, either by themselves or combined with invariable quantities, becomes a *maximum* or a *minimum*, it must do so by the cessation of the velocity of its increase or its decrease, or, in other words, by its velocity becoming equal to nothing. In this case, the fluxion considered as proportional to the velocity must also become equal to nothing. Taking, then, this fluxion of the given function, an equation will be obtained in finite terms, expressive of the relation of the quantities, when the assigned function is the greatest or the least possible. A still more difficult case is presented when the function itself of the variable quantity is the thing to be found; and such cases, accordingly, are those which have in a great degree exercised the ingenuity of modern analysts, especially those who have most sedulously and successfully cultivated the differential method. We are indebted to D'Alembert for a decided improvement in the integral calculus, that of *partial differences*, or as the English mathematicians, who still generally follow the notation and language of Newton, would style it, that of *partial fluxions*. It is particularly useful where we have to treat of the variation of a quantity considered as the functions of two variable quantities, while each of these two varies by itself, and the other is conceived to be constant; and it accordingly furnishes most important aid in sundry questions relative to physical astronomy and the motions of fluids. The perspicuity of Euler was particularly conspicuous in his labours to render this method at once convenient and comprehensive. Intimately connected with the differential calculus, but proceeding on a more general principle, is the *calculus of variations* invented by La Grange. In the differentia calculus, as generally practised before its introduction, as well as in the method of fluxions, the changes of variable quantities were considered as confined by certain limits. Thus the nature of the curve, for example, determines the relation of the fluxion of the ordinate to that of the abscissa. In the calculus of variations, on the contrary, the fluxion of the ordinate may be held to be independent of that of the abscissa, and not restricted even by the nature of the curve, but actually passing into another which has no determinate relation to the original one. Accordingly, this calculus is capable of an employment much beyond the purpose to which it was originally applied.

We shall conclude this essay with some remarks and propositions on maxima and minima, by which the application of some of the higher branches of analysis may be better understood. Every quantity, the value of which depends on one or more variable quantities, whether the relation between them be discoverable or not, is, in modern analysis, considered as a function of those quantities; and functions are distinguished by the number of the variable quantities on which they depend, quantities which are constant or invariable not being taken into account. Thus, in the equation $y = ax^2 + ba + c$, y is said to be a function of x of the simplest kind; and in $y = axz + bx^2 + cz^2$, y is a function of x, and z. When the value of y is given directly by that of x, without the resolution of an equation, it is said to be an explicit function of x; but if an equation must be resolved in order to discover the value of y, then y is called an explicit function of x. We have an example of the first in $y = a + bx + cx^2$; and of the second in $y^3 + ax^3 = bxy$. If, having the equation $y = ax$, it be supposed that x becomes $x + e$, or obtains an increment which may be so expressed, and that the new value of y be represented by y', we shall have $y' = ax + ae$, whence $y' - y = ae$; and dividing both sides by e, we obtain $\frac{y' - y}{e} = a$. Suppose, again, we have the equation $y = ax^2$, putting $x + e$ in place of e, we get $y' = a\ (x^2 + 2\ xe + e^2)$; taking the first equation from the second, we have $y' - y = 2axe + ae^2$, which, divided by e, becomes $\frac{y' - y}{e} = 2ax + ae$. If, again, $y = ax^3$, then, substituting $x + e$ for x, we get $y' = a\ (x + e)^3 = ax^3 + 3ax^2\ e + 3\ axc^2 + e^3$, whence we find $y' - y = 3ax^2e + 3axe^2 + e^3$, and consequently $\frac{y' - y}{e} = 3ax^2 + 3axe + ae^2$. A function which contains only one variable quantity is called a maximum, when that quantity can neither be increased nor diminished without the value of the function being made less than it was originally; and it is a minimum when the variable quantity cannot be increased or diminished without making the value of the function greater than it was before. The variable quantities being denoted by the last letters of the alphabet, the same letters with accents over them express the arbitrary quantities by which those variable quantities are supposed to be either increased or diminished, and thus $x - x'$, x, $x + x'$ express different successive variable values of x. If in an algebraic function which contains variable quantities, the sum of a variable quantity and its arbitrary increment be substituted for each of the variable quantities, and the function thereof be expanded, that part of the expansion which contains the first powers of the second increments is called the first derivative of the function; that which contains the second powers of the increments, multiplied by 1.2 is the second derivative, and that containing the third powers, multiplied by 1, 2, 3, is the third derivation, &c.

Let it be required to find the derivative of the power of the variable quantity x, as $x^{\pm \frac{m}{n}}$. Here the expansion of $(x + x')^{\pm \frac{m}{n}}$ is $x^{\pm \frac{m}{n}} \pm \frac{m}{n} x^{\pm \frac{m}{n} - 1} x'$, &c.; in which the second term is the only one containing the first power only of x, and accordingly the derivative of $x^{\pm \frac{m}{n}}$ is $\pm \frac{m}{n} x^{\pm \frac{m}{n} - 1} x'$ whence it follows that the derivative of any power of a variable quantity may be found by multiplying the proposed power by a number equal to the index, then diminishing its index by unity, and multiplying the result by the derivative quantity. The second derivative is obtained from the first, the third from the second, and so on. Farther, the derivative of the sums of any number of powers of variable quantities is the sum of the derivatives of the several powers. The derivative of two or more powers of variable quantities is found by multiplying the derivative of each of the powers by the product of the rest, and taking the sum of the resulting products; and the derivative of a fraction, the numerator and denominator of which are powers of two different variables, is found by multiplying the derivative of the numerator by the denominator, that of the denominator by the numerator, subtracting the latter product from the former, and dividing the result by the square of the denominator.

When the function of a variable is either a maximum or a minimum, its first derivative is equal to nothing Consequently, if there be several values of the variable quantity of the function, such that its derivative be equal to nothing, some of them may be such as to make the function a maximum, others a minimum; and it may be determined, whether any particular value of the variable quantity thus found belong to the greatest or least value of the function, by substituting successively for the variable quantity $a - d$, a, and $a + d$: for, if the first and last result be less than the second, the value (a) renders the function a maximum; if the first and last be greater than the second, the value (a) renders the function a minimum; and, finally, if either the first or the last be real and the other imaginary, the function may be both a maximum and a minimum. On the other hand, when there is no value of the variable quantity which makes the first derivative equal to nothing, the function does not admit either of a maximum or a minimum.

If the variable quantities contained in the function be not independent of each other, but have certain relations expressed by one or more equations, as many of the variable as can must be eliminated by these equations, and then the greatest or least value of the function containing the rest of the variable quantities must be investigated. But if the number of variable quantities exceed the number of the conditions of the question, any function may be reckoned constant, provided the conditions assumed and the real conditions do not exceed in number the variable quantities. Supposing the function to be of a given magnitude, the form of the algebraical result will sometimes make the greatest or least magnitude of the function to appear.

Suppose it be required to find the greatest of all equi-angular and isoperimetrical (equally bounded) parallelograms. Let $2b$ denote the common perimeter, and x one of the sides of any of the parallelograms; $b - x$ will denote the other side; and, as equi-angular parallelograms have to one another the same ratio as the rectangle contained by the homologous sides, the parallelogram will be the greatest when the rectangle, that is, $x(b - x)$ is the greatest; and it will be greatest when $x = \frac{b}{2}$, that is, when the figure is equilateral. This conclusion is deducible from the elementary principles of geometry, by which it can be made appear that the square is the greatest of all rectangles of equal perimeter.

If the greatest of all isoperimetrical triangles on the same given base be required, let a be the given base, $2p$ the common perimeter, and x either of the sides of any of the triangles, then $2p - a - x$ will denote the other side of that triangle. Now, it can be shewn that the triangle is equal to $\sqrt{p \cdot (p - a) \cdot (p - x) \cdot (a + x - p}$, which is, consequently, the maximum; and it will be the greatest when $(p - x) \cdot (a + x - p)$ is greatest, and when $x = \frac{2p - a}{2}$, that is, when the triangle is isosceles, a proposition which can also be demonstrated geometrically. It follows, that of whatever magnitude the base of a triangle of given perimeter may be, the triangle cannot be a maximum unless it be isosceles; and, accordingly, if it were required to find the greatest isosceles triangle of a given perimeter, let $2p$ be the given perimeter, and $2x$ the base of an isosceles triangle of that perimeter, and then $\frac{2p - 2x}{2}$ or $p - x$ will denote the side of the triangle, and $\sqrt{(p - x)^2 - x^2}$ the perpendicular drawn from its vertex to its base; therefore the triangle is equal to $\sqrt{(p - x)^2 - x^2} . x$, or to $\sqrt{p^2 - 2px} . x$, which is to be the maximum. Wherefore $\sqrt{p^2 - 2px}$. $x' - \frac{px'}{\sqrt{p^2 - 2px}} x . = 0$; $p^2 - 2px = px$; $3px =$

p^2; $x = \frac{p}{3}$, and $2x = \frac{2p}{3}$; that is, when the triangle is greatest it is equilateral, as can be shewn geometrically.

If it be enquired which of all quadrilateral rectilineal figures inscribed in the same given circle has the greatest perimeter, let a be the diameter of the given circle, x and y the two sides of the inscribed figure, not supposed equal to each other. Then it can be shewn by the elements, that $x^2 + y^2 = a^2$, whence $y = (a^2 - x^2)^{\frac{1}{2}}$ and $2x + 2y$, or $x + y$, that is $x + (a^2 - x^2)^{\frac{1}{2}}$ is to be a maximum. Wherefore $x' - \frac{x \,.\, x'}{(a^2 - x^2)^{\frac{1}{2}}} = 0$; so $(a^2 - x^2)^{\frac{1}{2}} = x$; $a^2 - x^2 = x^2$; $a^2 = 2x^2 = x^2 + y^2$; $x^2 = y^2$, and $x = y$; that is, the inscribed figure which has the greatest perimeter is a square.

The process by which these and many similar problems have been solved, as is noticed by Mr Cresswell, from whose Elementary Treatise on Maxima and Minima, they are abridged, is the same as would have been employed had they been treated fluxionally; and, in reality, from the principles on which it is founded all the rules of the method of fluxions have been deduced by La Grange. This confirms the remarks formerly made as to the correspondence of the fluxionary with the differential calculus. The reader will have perceived, that the results of the process are precisely such as geometry would yield; and, accordingly, it is one of the objects of Mr Cresswell, whose work is recommended to the student, to invite a comparison between geometry and algebra, not in respect of power, considered merely as an operative agent, for here the superiority of the latter is unquestioned and unquestionable, but as an exercise of the mental faculties, and, consequently, as a branch of liberal education. In the preference which, on this account, he awards to the former, it is impossible, we conceive, for any one who can appreciate his reasoning, not to concur; and, accordingly, a sentence in Mr Leslie's preface to his excellent work on Geometrical Analysis, though applied, in the first instance, only to one branch of the science, may be considered fairly applicable to the whole question, as it points out the respective provinces of the two methods. "The superior elegance and perspicuity with which the geometrical process unfolds the properties of the higher curves may shew that the fluxionary calculus should be more sparingly employed, if not reserved for the solution of problems of a more arduous nature." Regarding mathematics, then, not merely on account of the intrinsic value of the science, which, it is needless to say, is really above all conceivable estimate, but for the sake of its indirect advantages, the close attention, the methodizing and consecutiveness of thought, the connecting together of related truths, and the logical statement and prosecution of them which it promotes in those who cultivate it, we perfectly assent to Mr Cresswell's concluding claims and recommendation. "If the view which has here been taken of this subject be just, it should seem to be no disservice to our established system of education, to afford scope for the efforts of our junior students in an easy extension of those rudiments of knowledge which they learn from Euclid. It is impossible for them to enter upon a more fertile field than that of geometry, which really seems to admit of the exercise of as much genius and invention as poetry itself; and after having thus strengthened their faculties, and accustomed themselves to the comparison of clear ideas, they will proceed with better success to the remaining part of their academical course. A permanent taste for the mathematics will thus be formed, and a study which is now too frequently thrown aside as soon as it has answered a temporary purpose, will become a valuable resource to amuse and adorn their future leisure."

END OF VOLUME FOURTH.

Directions for Placing the Plates of Vol. IV.

PART I.

Plate 97—98, opposite to page	150.
—— 99—102, - -	174.
—— 102—104, - -	302.
—— 105—106, - -	364.

PART II.

Plate 107, opposite to page -	482.
—— 108—109. No. 2. -	560.
—— 110, - - -	581.
—— 112, - - -	622.
—— 113—116, - -	700.
—— 117—118, - -	800.

ERRATA.

Page 599. *for* long buert *read* lang baert.
—— 650. — Ferræ *read* Feræ.
—— — — Erenaceus *read* Erinaceus.
—— — — Arotomys *read* Arctomys.
—— — — Oris *read* Ovis.

Page 654. *for* Caluga *read* Calugo.
—— 655 — Spec. 1. Murimus *read* Murinus.
—— 657. — Arsinus *read* Ursinus.
—— 685. — Oricetus *read* Cricetus.
—— 714. first col. line 44. from top, *for* "those" *read* "a man."

John Moir, Printer,
Edinburgh 1824.

MATHEMATICS PLATE 117.

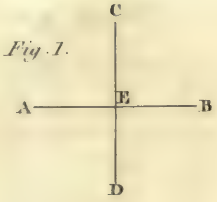


Fig. 1.

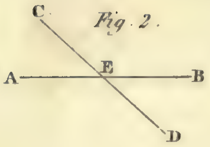


Fig. 2.

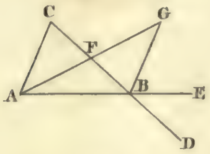


Fig. 3.

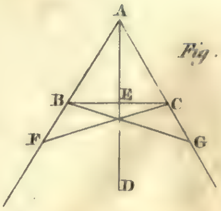


Fig. 4.

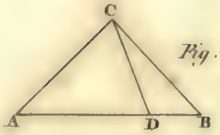


Fig. 5.

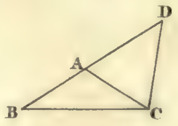


Fig. 6.

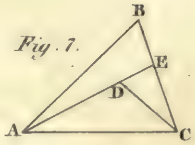


Fig. 7.

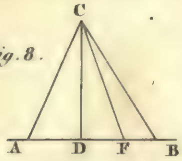


Fig. 8.

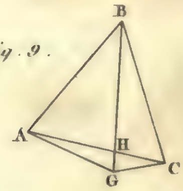


Fig. 9.

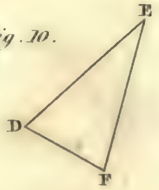


Fig. 10.

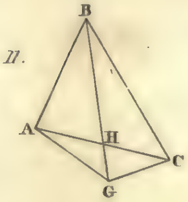


Fig. 11.

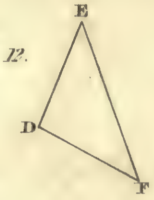


Fig. 12.

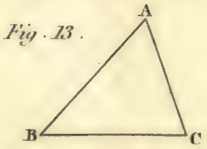


Fig. 13.

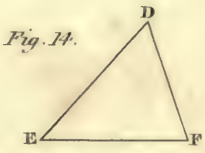


Fig. 14.

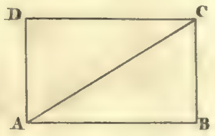


Fig. 17.

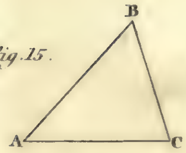
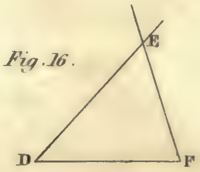


Fig. 15.



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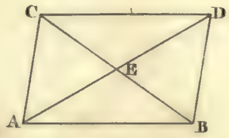


Fig. 18.

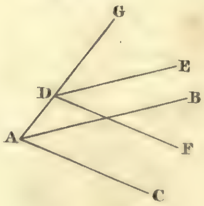


Fig. 19.

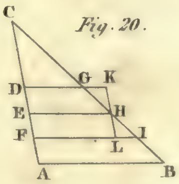


Fig. 20.

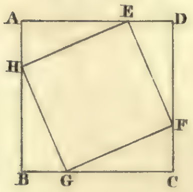
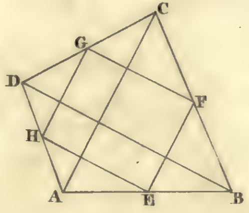


Fig. 21.



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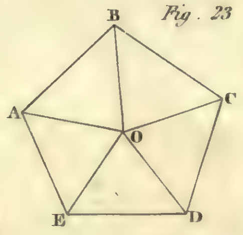

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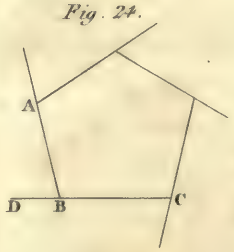

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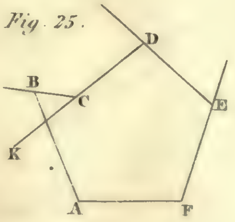

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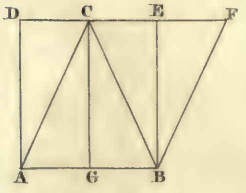

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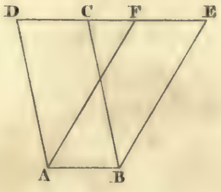

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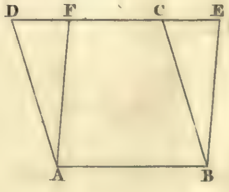

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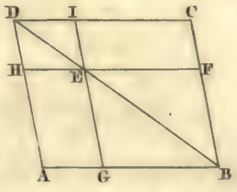

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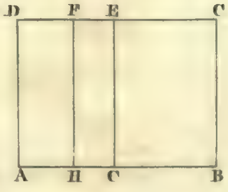

Fig. 30.

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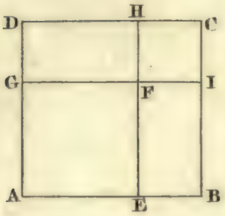
MATHEMATICS PLATE 118.

Fig. 31.



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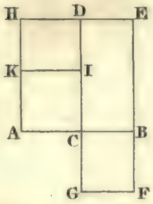

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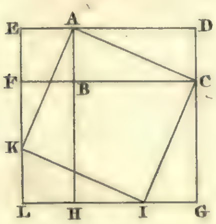

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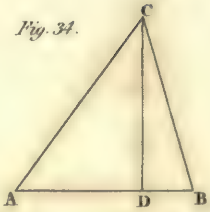

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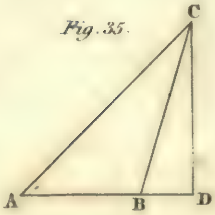

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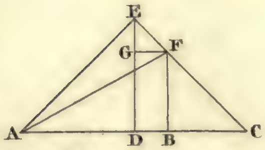

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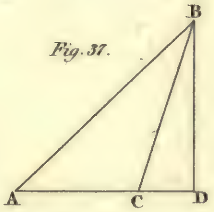

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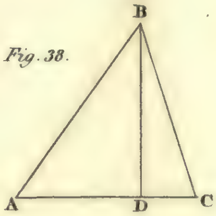

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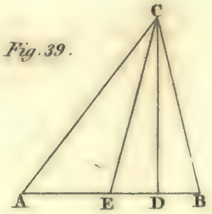

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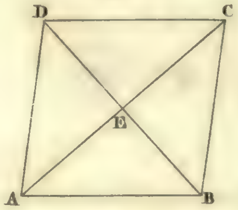

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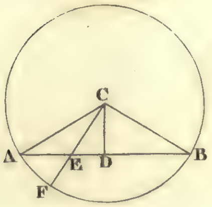

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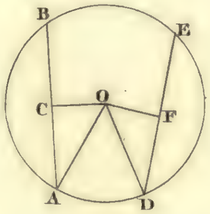

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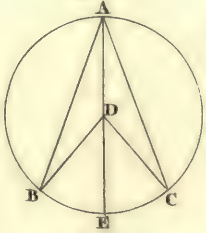

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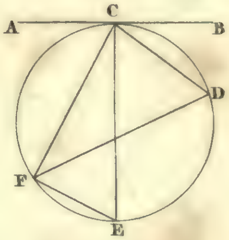

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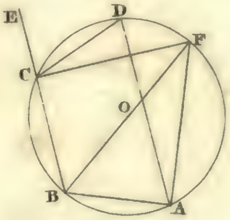

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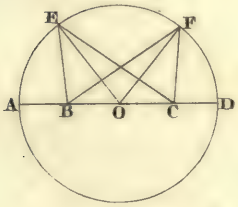

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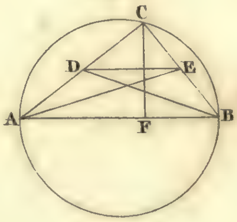

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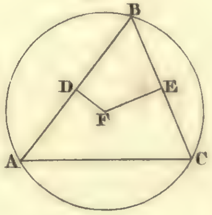

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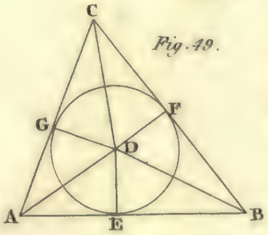

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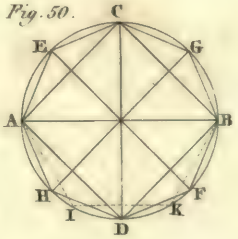

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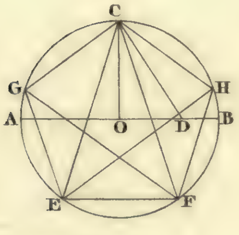

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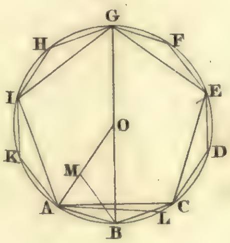

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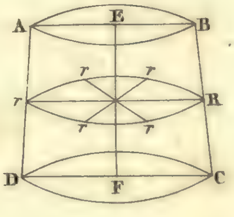

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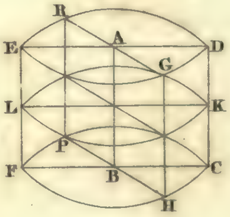

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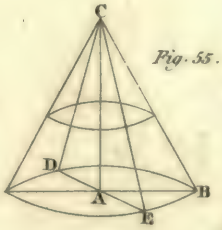

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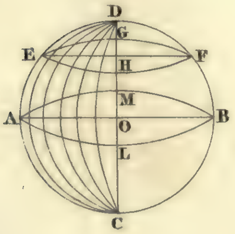

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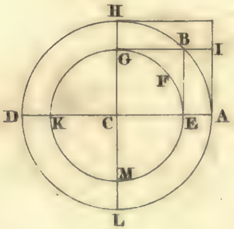

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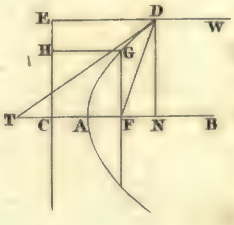

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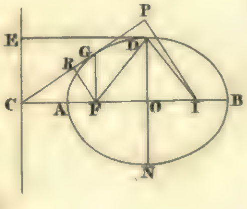

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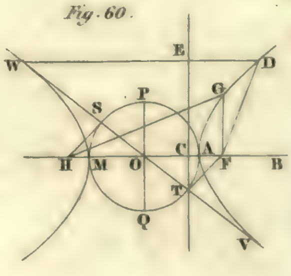

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